

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
TORONTO,

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TORONTO,



YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1882, TO JUNE 30,

1883.

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
TORONTO.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
CONFERENCE

AT THE

TWENTIETH ANNUAL MEETING

HELD AT

SOUTHPORT,

SEPTEMBER, 1883.

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OF THE

British Pharmaceutical Conference.

1882-83.

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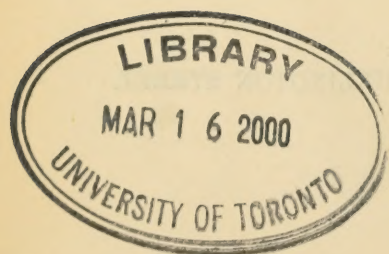
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THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1884 will be held at Hastings, on Tuesday and Wednesday, August 12th and 13th.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from

THE SECRETARY; BRIT. PHARM. CONF.,
17, Bloomsbury Square, London, W.C.

THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 369.

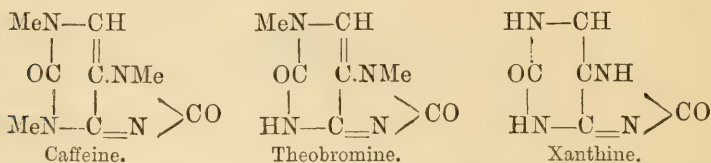
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INTRODUCTION.

THE numerous contributions to the past year's literature of organic chemistry afford evidence of the untiring zeal and devotion with which this vast field of inquiry continues to be explored by an ever-increasing number of able investigators. Mindful of the steady advance made during the preceding years towards the synthesis of important vegetable alkaloids, the reader of this volume will probably direct his first attention to this subject; and though as yet he may not find the task actually accomplished, he will not look in vain for results throwing additional light on the constitution of these bodies, and thus paving the way towards the successful solution of the main problem. In a paper on the constitution of atropine and its derivatives, Professor Ladenburg has collected together the various facts bearing on this subject, and thus gives a valuable historical sketch of his famous research. In addition to this, he publishes some new observations respecting tropidine, showing that the hydrobromide of this base, when treated with a large excess of bromine at 160° C., yields dibromopyridine along with ethylene bromide, a result proving tropidine to be ethylenhydromethylpyridine. The dibromopyridine obtained in this reaction is identical with that obtained from piperidine. The relation between morphine and codeine, the recognition of which enabled E. Grimaux some time ago to effect the conversion of the former alkaloid into the latter, now receives some additional elucidation, from a further study of the subject by the same chemist, as well as by E. v. Gerichten and H. Schrötter. D. B. Dott, in a paper read before the British Pharmaceutical Conference, discusses the question in what state of combination morphine occurs in opium, and arrives at the conclusion that it exists in this drug both as meconate and sulphate. Dr. E. Fischer continues his researches on the alkaloids caffeine, theobromine, and xanthine, and shows how readily each one of these bases can be artificially prepared from guanine, by

converting the latter into xanthine, this into theobromine, and this again, by Strecker's method, into caffeine. The results of a close study of these derivatives and decomposition-products induce him to regard the constitution of these homologous bases as in accordance with the following formulæ:—



The often-debated question, whether or not caffeine is capable of combining with organic acids, is again revived by C. Tanret, who finds that it does not possess this power, and that the so-called organic salts of this alkaloid have no real existence, but are mere mixtures of acid and base. The correctness of this conclusion, however, is disputed by Dr. H. Biedermann, who, at the request of Prof. Schmidt, has re-investigated this subject, and claims to have prepared and analysed a number of definite salts of caffeine, including the formate, acetate, butyrate, and valerianate; but he admits that these combinations are so extremely unstable as to be quite unsuited for medicinal use. It will be observed that Dr. Biedermann's views are quite in accord with those expressed some time ago by J. U. Lloyd with reference to caffeine citrate (*Year-Book of Pharmacy*, 1881, 38).

A. Goldschmidt makes the interesting announcement that the fusion of strychnine with potassium hydrate results in the formation of indole, and promises further communications on this subject. Commercial sulphate of strychnine is shown by M. Lextrait to vary very much in its composition, being sometimes the acid and sometimes the normal salt, with varying proportions of water of crystallization. He regards the normal sulphate containing five molecules of water, crystallized from a solution in strong alcohol, as the best and most stable for medicinal use. The quantitative separation of strychnine from brucine forms the subject of a further report by W. R. Dunstan and F. W. Short, in which these chemists describe a very promising process based upon the difference in the solubility of the ferrocyanides of the two alkaloids. The same authors also call attention to the enormous difference in the alkaloidal strength of commercial specimens of tincture of nux vomica, resulting partly from variations in the seeds used, and partly from their more or less imperfect extraction.

Dr. E. Bosetti reports on the composition of the officinal veratrine of the German Pharmacopœia, which he finds to consist of two isomeric alkaloids of the formula $C_{32}H_{49}NO_9$, one of which is crystallizable and practically insoluble in water, whereas the other is uncrystallizable but soluble in water. The former, which he calls *veratrine*, is identical with the *cevadine* of Wright and Luff, while the latter, which he proposes to name *veratridine*, is identical with the soluble veratrine of Weigelin and E. Schmidt. A report on colchicine, by S. Zeisel, deals chiefly with colchicine and apocolchicine, the products of the action of mineral acids on very dilute solutions of colchicine.

A research on gelsemine, by A. W. Gerrard, establishes the fact that this alkaloid can be obtained as a crystalline colourless solid, forming crystalline salts with acids; and further, that the composition of the pure base answers to the formula, $C_{12}H_{14}NO_2$, which differs greatly from that given by Sonnenschein. The detection of gelsemine in forensic investigations is discussed in the same paper, as well as in another by E. Schwarz.

W. A. H. Naylor has continued his investigation of the bitter alkaloidal substance isolated by him a short time ago from the bark of *Hymenodictyon excelsum*, and has communicated his results to the recent meeting of the British Pharmaceutical Conference. From these it is evident that the body in question is neither identical with paricine, though closely allied with it, but is a new alkaloid, the composition of which is represented by the empirical formula, $C_{24}H_{40}N_3$. The same bark has also yielded him a bitter neutral principle of the formula $C_{25}H_{49}O_7$.

Much attention has recently been directed to a new synthetically prepared base introduced under the name of "*kairine*," which is stated to rival quinine in its antipyretic properties, and to be free, at the same time, from the slightest tendency to produce local irritation. It is oxyquinoline-methylhydride, and shares its physiological action with quinoline-methylhydride or kairolin, and also with quinoline-ethylhydride. Drs. O. Fischer and W. Königs, who have prepared these bodies, state that the power of reducing the temperature in fevers is possessed by all hydrides of quinoline in which the nitrogen atom is in direct combination, not merely with the two atoms of carbon belonging to the quinoline ring, but also with the carbon of a methyl group or of another alcohol radical.

Not one year ever passes without yielding fresh contributions to the chemistry of the cinchona alkaloids. C. H. Wood and E. L.

Barret publish a new process for ascertaining the purity of quinine, which is based on the difference in the solubility of this alkaloid and the other cinchona basis in benzene. Dr. G. Vulpius directs attention to a peculiarity observed by him in the behaviour of quinine hydrochlorate towards silver nitrate. If a weak solution of the latter be slowly added to a likewise weak solution of the former, no precipitation of silver chloride takes place, owing probably to the formation of a soluble double chloride. With an excess of silver nitrate a precipitate is formed. The oxidation of cinchonine by means of chromic acid has been made the subject of a further study by H. Weidel and K. Hazara, from whose researches it appears that only half of the cinchonine molecule is used up in the formation of cinchonine acid, the other half yielding a syrup, the solid constituents of which, when distilled with zinc dust, furnish pyridine, ethyl-pyridine, and quinoline, together with ammonium carbonate, pyrroline, and allied bodies. They conclude from these results that cinchonine must contain two hydrogenized quinoline-nuclei, a conclusion strengthened by the fact that the syrup obtained under like conditions in the oxidation of tetrahydrocinchoninic acid also yields bases of the pyridine series on distillation over zinc dust. Dr. O. Hesse supplies some further descriptions of the alkaloids hydrocinchonidine, conquinine, and hydroconquinine. The existence of the last-named body, however, is called in question by C. Forst and C. Böhringer, who assert that this substance is identical with hydroquinidine, the alkaloid obtained by them by the action of potassium permanganate on quinidine sulphate. The same action is now shown by these chemists to yield also another new alkaloid, of the formula $C_{19}C_{22}N_2O_4$, which they propose to name *quitenidine*.

The question whether or not quinoline, as obtained from the cinchona alkaloids, is identical with leucoline, the corresponding product from coal-tar, is ably discussed by S. Hoogewerff and W. A. v. Dorp, who arrive at the conclusion that these bases, when perfectly purified, do not show the slightest difference in their characters, reactions, or decomposition-products, and that the name "leucoline" may therefore be given up. A good deal of new information will be found in this volume respecting the bases of the quinoline and pyridine series, which form the subject of reports by O. de Coninck, E. Grimaux, H. Weidel & M. Russo, and G. L. Ciamician & M. Dennstedt, of which we may here mention that the two last-named chemists have succeeded in effecting the conversion of pyrroline into pyridine. C. Schotten deals at considerable

length with the derivatives and oxidation-products of piperidine; while A. W. Hofmann confirms the interesting observation, made by the latter as well as by Königs, that piperidine may be readily converted into pyridine. L. Rügheimer shows that piperine can be artificially prepared by allowing benzol solutions of piperic acid and of an excess of piperidine to act on each other.

We conclude our notice of the work done in connection with the chemistry of the alkaloids by calling the reader's attention to two reports on the production of alkaloids by the putrid fermentation of animal substances, this subject being an important one on account of its bearing on the detection of organic poisons in forensic investigations.

A. Christensen has prepared quassiin, the bitter crystallizable principle of quassia, in a purer condition than it has hitherto been obtained, and finds its formula to be $C_{31}H_{42}O_9$. It is decomposed on prolonged boiling with dilute mineral acids; but the products of this action show that quassiin is not a glucoside. The similarity in constitution between æsculetin, umbelliferone, and coumarin has been understood for some time, and now receives further light from recent researches by F. Tiemann and W. Will, confirming the observation that umbelliferone is a hydroxycoumarin, and showing at the same time that æsculetin must be regarded as a dihydroxycoumarin. The constitution of arbutin and helicin continues to engage the attention of H. Schiff, who describes a number of new combinations affording additional proof of the aldehydic nature of helicin. Some time ago it was shown by Lisenko that helicin, prepared from salicin, may be reconverted into the latter by the action of sodium amalgam. A. Michael has now applied this reaction to artificial helicin, produced by the action of acetochlorhydrose on potassium salicylate, and finds the salicin thus obtained identical in all its properties with the natural product.

Comparative experiments of the essential oils of cinnamon and cassia conducted by A. H. Jackson lead to the conclusion that the differences between the two oils, both as regards their physical and chemical characters, are so slight as not to afford any satisfactory means of distinction. The results of an examination of the oil of cinnamon leaves by E. Schaer are confirmatory of those previously published by Stenhouse. Among other volatile oils investigated during the year may be named those of thyme, angelica, garden sage, marjoram, turmeric, erechthites, *Erigeron canadense*, and the solid oil (camphor) of *Ledum palustre*.

R. Meyer and E. Müller have repeated their synthesis of cumic

acid on a larger scale, with the view of examining the cause of discrepancy between the melting-point of their synthesized acid and that of ordinary cumic acid. They prepare cumene by the action of isopropyl bromide on benzene in the presence of aluminium bromide, then convert the product into parabromocumene, and submit the latter, after careful purification, to the action of sodium and moist carbonic anhydride. The acid thus obtained no longer shows the discrepancy above alluded to, but agrees perfectly in its melting-point and all other characters with the natural product. The conversion, under varying conditions, of alkaline formates into oxalates forms the subject of an investigation by V. Merz and W. Weith, in which it is shown that sodium formate, when heated at 420° , yields 70–75 per cent. of oxalate, which may be easily freed from the undecomposed formate by recrystallization from hot water. As the synthesis of the formate from carbon monoxide and sodium hydrate presents no difficulties, this process for the artificial production of oxalic acid promises to become available for the manufacture of this acid on a large scale.

The alleged power of oxalic acid to reduce arsenic acid to the arsenious state, which had been called in question by W. A. H. Naylor and J. O. Braithwaite, is reasserted by C. Patrouillard, who admits, however, that this reducing action is limited to solutions of alkaline arseniates, and does not take place with free arsenic acid. Induced by this statement to reinvestigate the subject, Naylor and Braithwaite report that the reduction fails alike both with combined and free arsenic acid, and that the evidence of reduction obtained by Patrouillard must be attributed, not to the action of the oxalic acid, but to the effect on the mixture of the sulphuretted hydrogen or ammonium sulphhydrate added as a test.

Several new processes are published for the preparation of pure hydrochloric acid. In one of these the sulphuric acid to be employed is previously mixed with a little potassium permanganate in order to prevent the formation of any sulphurous acid, and the hydrochloric acid gas, before being passed into water, is conducted through a bulb-tube containing mercury, which will absorb the free chlorine and decompose any chloride of arsenic contained in the gas. Another process consists in the removal of arsenic and sulphurous acid from commercial hydrochloric acid by diluting the latter to a specific gravity of 1.12, and distilling it with the addition of a little potassium chlorate. W. Spring casts doubt on the existence of pentathionic acid, and asserts that the body known by that name is merely a solution of sulphur in tetrathionic acid. In an interest-

ing paper read before the Pharmaceutical Society, W. R. Dunstan and F. Ransom throw new light on the action of chlorine and solutions of sodium carbonate. Before an excess of chlorine has been used, and while the liquid is still alkaline, the latter contains sodium hypochlorite and sodium chloride, while the gas evolved consists of chlorine and carbonic anhydride. In the next stage of the process carbonic acid gas is given off, and the liquid contains both sodium hypochlorite and free hypochlorous acid. The further introduction of chlorine destroys the sodium hypochlorite, and yields a solution of sodium chloride, free hypochlorous acid, and sodium bicarbonate. Beyond this point, carbonic acid gas is given off with effervescence; and if the treatment with chlorine be continued until this effervescence ceases, the solution contains hypochlorous acid, sodium chloride, and some sodium chlorate. These observations, as well as the results of analyses of commercial samples of the official solution of chlorinated soda, demonstrate that this liquid contains free hypochlorous acid, but not sodium hypochlorite, as is generally supposed.

The ordinary mode of preparing hydrated ferric oxide, by precipitating the chloride with ammonia, yields a product invariably contaminated with some basic chloride, which is exceedingly difficult to remove from the bulky gelatinous precipitate by washing. Attempts made by L. T. Wright to render the precipitate more compact by adding the ferric chloride solution slowly to an excess of ammonia, evaporating the whole mixture to dryness at 100° C., and treating the residue with water, have yielded it in the form of an impalpable reddish brown powder, which differs essentially from ordinary precipitated ferric hydrate, in not being blackened by sulphuretted hydrogen.

The removal of arsenic from metallic zinc may be completely and readily effected, according to Prof. Selmi, by the addition of a lump of sal ammoniac to the metal previously melted in a crucible, whereby the whole of the arsenic is stated to be volatilized as trichloride. The occurrence of arsenic in commercial caustic soda, traceable to the Leblanc process, is pointed out by E. Donath, who has also observed the occasional presence of traces of vanadium in the same product. E. Filhol and Senderens describe neutral arseniates as well as neutral phosphates of sodium consisting of equal molecular weights of mono- and di-sodium salt. Double potassio-sodium and sodio-ammonium salts of the same constitution have likewise been obtained by them in a definite crystalline forms. C. Rammelsberg reports upon the composition of crystals observed by Bauer to form

during the evaporation and crystallization of large quantities of solutions of potassium bicarbonate. The crystals, which show no tendency to either deliquescence or efflorescence, prove to be a sesquicarbonate of the formula $2K_2CO_3, H_2CO_3 + 3H_2O$. The apparent alkaline reaction of normal potassium chromate is explained by M. Richter by the oxidizing action of the chromic acid on the colouring matters of litmus and turmeric, and the consequent formation of free potash. Phenolphthalein fails to indicate the slightest alkalinity, provided the chromate is pure. The view that potassium bichromate is a molecular combination of the monochromate with an easily displaceable molecule of chromic anhydride, receives fresh support from a study of the reaction of this salt with barium chloride by M. Prudhomme and F. Binder. Some time ago it was stated by E. Donath that, while free chromic acid readily liberates free iodine from potassium iodide, bichromates are without action on this salt, and that consequently potassium iodide might be employed for the detection of uncombined chromic acid in the simultaneous presence of chromates and bichromates. The fallacy of this statement is demonstrated by M. Richter, whose results show that the iodide is completely though slowly decomposed by pure potassium bichromate. As monochromates produce no effect upon iodides, this reaction may be used for the detection of bichromates in these salts.

Many of the recent contributions to the literature of analytical chemistry call for a brief notice in this introductory chapter. M. Buisson publishes a new process for the volumetric determination of lead, which is based on the precipitation of the metal by a titrated solution of potassium chromate, and the decomposition of the excess of the reagent by means of a cold solution of potassium iodide in the presence of sulphuric acid. From the amount of iodine thus liberated, the excess of chromate used, and consequently the amount of lead present, can be readily calculated. S. Rovera calls attention to the failure of sulphuric acid to indicate lead in solutions containing ammonium citrate, due to the solubility of the sulphate in the alkaline citrate. V. Lehmann discusses the relative merits of the various processes in use for the detection of lead, silver, and mercury in forensic investigations, and lays stress on the necessity of destroying the organic matter by means of hydrochloric acid and potassium chlorate before precipitating the metals from the substances under examination. In a paper on mercuric chloride, H. Debray points out the disturbing effect produced by the presence of a large proportion of sodium chloride on some of the reactions

of this salt. A new mode of separating copper and cadmium is described by A. Orłowski. The blue ammoniacal liquid containing the two metals, as obtained in the usual course of analysis after precipitation of the bismuth by ammonium hydrate, is acidified with hydrochloric acid, then decolorized by means of stannous chloride, and afterwards boiled with milk of sulphur. The copper is thus completely precipitated as sulphide; and the filtrate, after being freed from tin by an excess of ammonia, may be tested for cadmium with sulphuretted hydrogen. Two modifications are suggested in the titration of iron by means of sodium hyposulphite. A. C. Oudemans proposes to determine the iron in the acid solution of the chloride, to which a little solution of copper sulphate and potassium sulphocyanide has been added, by dropping in a solution of sodium hyposulphite of known strength until the red colour of the iron sulphocyanide has disappeared, and determining the excess of hyposulphite by titrating back with iodine solution. A. E. Haswell improves this method so as to avoid the possibly disturbing separation of copper sulphocyanide, and to dispense with the back titration with iodine. He mixes the moderately acid solution of ferric chloride, containing a small quantity of a cupric salt, with a few drops of a dilute solution of sodium salicylate, and then reduces with sodium hyposulphite. The deep violet colour of the solution fades gradually and becomes colourless in presence of a very slight excess of the reducing agent. The excess of sodium hyposulphite is then oxidized with a dilute solution of sodium bichromate, the limit of the reaction being sharply marked by the violet coloration which indicates the re-oxidation of the first trace of iron. The well-known method of separating barium from strontium and calcium by means of potassium chromate and acetic acid forms the subject of a critical study by J. Meschezerski, who arrives at the conclusion that, though applicable in qualitative analyses, it is not suited for exact quantitative work. D. Sidersky recommends a new process for the separation and determination of strontium and calcium, the leading features of which are the following:—The liquid containing the two metals is warmed and mixed with a moderate excess of a strong solution of ammonium sulphate and ammonium oxalate, whereby strontium sulphate and calcium oxalate are precipitated. The latter is separated from the washed precipitate by means of dilute hydrochloric acid, then re-precipitated from the solution by an excess of ammonium oxalate, and washed, ignited, and weighed in the usual manner. The portion insoluble in the hydrochloric acid is strontium sulphate. For the volumetric determination of sul-

phuric acid, free or combined, A. Guyard suggests the addition of the solution from a burette to a measured quantity of standard normal solution of lead nitrate coloured bright yellow by means of a few drops of solution of potassium iodide. The titration is completed as soon as the yellow colour of the mixture is discharged. The formation of a white precipitate on mixing solutions of borates and of manganese sulphate forms the basis of a process for the determination of boracic acid proposed by E. F. Smith. The precipitation is rendered complete by the addition to the mixture of an equal volume of alcohol, and the excess of manganese is then determined in the filtrate by Volhard's method. Sulphocyanides may be volumetrically estimated by dropping the solution from a burette into a measured quantity of decinormal solution of silver nitrate, previously mixed with a small quantity of iron nitrate, until the mixture assumes a permanent red colour. R. A. Cripps points out a serious error in the statements of the United States Pharmacopœia relative to the process given therein for estimating the strength of hydrocyanic acid. He shows that potassium chromate, instead of indicating, as supposed in the Pharmacopœia, the volume of silver nitrate solution required for the complete formation of double cyanide of silver and magnesium, really indicates twice that volume of the test solution: a quantity sufficient, not merely for the complete formation of this soluble double salt, but also for the subsequent precipitation of the whole of the cyanogen in the form of silver cyanide. Observations made a few years ago by G. Vortmann respecting the different behaviour of chlorides, bromides, and iodides towards the peroxides of lead and manganese in presence of acetic acid, have now led to the adoption of a definite and practical method for the direct estimation of chlorine in the presence of bromine and iodine, which will be welcome to all frequently engaged in determinations of this kind. This volume will likewise be found to contain abstracts of papers dealing with the analysis of mixtures of chlorides, bromides, iodides, sulphides, cyanides, ferro-cyanides, and ferri-cyanides. The power of peroxide to convert certain sulphides into sulphates has induced A. Classen and O. Bauer to study the range of applicability of this substance as an oxidizing agent in analytical operations, and to demonstrate its usefulness in this direction. Bromine is recommended by C. L. Bloxam as a distinguishing test for a number of well-known organic alkaloids.

Among the contributions to water-analysis, we wish to call the reader's attention to an interesting investigation instituted at the

instance of the American Government with the object of examining the chief processes employed for estimating the organic matter in potable waters, to test the absolute and relative accuracy of the results by these processes, and to ascertain the nature and scope of the practical conclusions which may be drawn from such results.

The analysis of wine, spirits, milk, and a number of commercial products will also be found to form subjects of papers published during the past year.

Before passing from the review of purely chemical literature to that of *materia medica* and pharmacy, we desire briefly to allude to a few contributions connected with physiological chemistry. J. Béchamp describes a series of experiments tending to establish the difference between the gastric and pancreatic digestions. In the former the rotatory power of the transformed matter is but little lessened, or remains unchanged, or may be increased; whilst in the latter it is always enormously reduced. From the results of experiments by E. Duclaux, it appears that, contrary to the prevailing opinions, pancreas does not possess the power of digesting itself. In order to investigate the relation of peptones to albumen, A. Poehl has studied the conversion of albumen into peptone, and finds that this conversion must be attributed to the swelling up of the colloid of albumen. Haubner's observation, that a considerable quantity of the cellulose of the fodder of ruminating animals disappears in the alimentary canal, has induced W. Tappeiner to investigate the nature of this digestion. The conclusion he arrives at is that the cellulose is dissolved by fermentation in the stomach and cæcum. T. Pfeiffer, B. Tollens, and F. Salomon publish the results of experiments undertaken with the view of throwing further light on the elementary composition of starch. In their opinion the formula $C_{24}H_{40}O_{20}$ should be accepted as the one correctly representing the composition of the molecule of this body. A research on chlorophyll, by A. B. Frank, leads to the inference that the change of colour of leaves in autumn is due to the disappearance of the protoplasm of the cells, in consequence of which the chlorophyll grains come into contact with the acid cell sap, the result being the change of the green colour into yellowish green or yellow. E. Erlenmeyer and A. Lipp have practically accomplished the synthesis of tyrosine, a body hitherto obtained only as a product of decomposition of proteids; and a similar success has been achieved with regard to uric acid by J. Horbaczewski.

Among the remedies brought to the notice of the medical pro-

fession during the past year, some are entirely new, while others have already enjoyed a popular reputation in past times. As an instance of the latter, we refer to the mullein plant, *Verbascum Thapsus*, which, a long time ago, was held in high esteem as a remedy in pulmonary disorders, and has retained its reputation in some countries up to the present day. The claims of this plant to the attention of the profession are ably advocated in a paper read before the Southport meeting of the British Pharmaceutical Conference by Professor Quinlan, in which special stress is laid on its value in the early stages of consumption. F. Stearns calls attention to the medicinal value of *Phyllanthus Nivuri*, the leaves of which are said to enjoy a great reputation among the native Indians as a diuretic in dropsical conditions, as well as in gonorrhœa and affections of the bladder, while the root is useful as a remedy for jaundice and similar complaints. Dr. J. Jardine reports very favourably on koromiko (*Veronica salicifolia* and *V. parviflora*), a drug greatly esteemed in China, as well as in New Zealand, as a remedy for dysentery and diarrhœa. The burdock, *Arctium Lappa*, the roots of which have long been employed by herbalists in skin diseases, is now recommended in the form of a tincture made from the seeds, for the relief of *psoriasis inveterata*. The bark of *Exostemma Caribæum*, a rubiaceous shrub indigenous to Mexico, the West Indies, and Guiana, is reported to possess febrifuge properties recommending it as a substitute for cinchona bark. *Eucalyptus Rostratus* has now been extensively tried in all forms of diarrhœa, for which it has proved to be a valuable remedy. The mango fruit (*Mangifera Indica*) is being tried in the United States as an astringent, and is stated by Dr. Linguist to exercise a special tonic action on the mucous membrane, rendering it very valuable in the treatment of hæmorrhage and mucopurulent discharges. J. M. Blackerly speaks highly of *Chionanthus virginica* as a remedy in chronic cases of enlarged and indurated liver, in which he finds it superior to leptandrin, euonymin, podophyllin, and phosphate of sodium. *Geum album* is spoken of by Dr. W. A. Spurgeon as an anti-emetic, relieving gastric irritation and headache. *Stachylarpheia jamaicensis*, a verbenaceous plant used in Jamaica as an emmenagogue, is administered in Brazil as a remedy for rheumatism, and applied externally for healing ulcerated wounds. Guacamacha, a South American tree related to the oleander, is now receiving some attention on account of the value of its bark as a hypnotic and as a remedy in diseases with increased action of the motor apparatus.

J. E. Howard draws attention to the remarkable effect which

altitude seems to exercise on *cinchona succirubra* with regard to the proportion of alkaloids contained in its bark. With an increase of altitude there seems to be a marked increase in the amount of total alkaloids, and especially in that of quinine and cinchonidine; while a decrease is observed in the proportion of cinchonine and quinidine. Both D. Morris and Dr. B. H. Paul publish analyses of *cinchona* barks grown in Jamaica and presented to the museum of the Pharmaceutical Society by the Colonial Office. A comparison of their results with those of analyses of Jamaica grown barks made by Dr. Paul in 1878, leads to the inference that, with further growth, there has been in most instances a notable improvement in the quality of the bark. Prollius, Kissel, Biel, Fairthorne, and N. H. Meyer publish new processes for the assay of *cinchona* bark; and the last-named author adds a useful *résumé* of the principal methods already in use. Cuprea bark, which has attracted a good deal of attention during the last few years as a new source of quinine, has been further examined by G. Körner, Dr. O. Hesse, and Prof. Planchon, the latter of whom confirms Triana's observation that this bark is not derived from a species of *cinchona*, but from several species of *Remijia* (*R. pedunculata* and *R. purdicana*). The origin of cassia lignea has at length been definitely cleared up by Prof. Oliver and C. Ford, whose reports fully confirm what hitherto was nothing more than a supposition; viz., that this bark is the produce of *Cinnamomum cassia*.

Dr. Squibb publishes some valuable results obtained by himself in experiments with aconite root. He considers it a good test of the quality of this drug if eight out of ten roots, broken across the middle, produce a tingling taste when a minute fragment is bitten off and chewed for a moment between the front teeth. The importance of examining this root, and of making sure that it is really the produce of *Aconitum Napellus*, is also strongly insisted upon by T. B. Groves, especially if it be intended for the preparation of aconitine. This chemist regrets the small extent to which medicine has so far profited by the light which chemical research has shed upon the aconite bases, and strongly advises pharmacists to use none but crystallized aconitine, as best obtained from the crystallized nitrate, for internal administration. The root of *Rheum compactum*, cultivated in Moravia, is favourably commented upon, and its application in medicine advocated on account of its low price and good quality,—five parts of the Moravian rhubarb being fully equal in activity to four parts of the Chinese drug. F. Buddell points out a remarkable relation between starch and atropine in

belladonna. Roots containing starch are found always to contain a larger proportion of alkaloid than those in which starch is absent. The roots of young plants contain little or no starch; but as the plant ages the starch increases, and with it the percentage of atropine. C. C. Klump gives the results of some experiments with commercial podophyllin, showing that the portion soluble in ether represents the active ingredient of the resin. The use of alum in the preparation of podophyllin increases the yield by 20 per cent.; but as this increase consists of insoluble resin, the product is less active in proportion. Dr. H. Hager finds the specific gravity of jalap to afford a fair criterion of its quality, and advises the rejection of all tubers having a lower specific gravity than 1.14. An examination of Curaçao aloes by Stallman and Fulton shows this species to deserve a wider attention than has hitherto been given to it, inasmuch as it proves fully equal to Soccotrine aloes, notwithstanding its much lower price. W. A. Shenstone records a series of experiments on Jafferabad aloes, the results of which establish the fact that the aloin of this species is identical with that of Zanzibar aloes. Reports on aloes by A. Klunge and W. Lenz deal with the reactions by means of which the presence of this drug may be recognised in mixtures. E. M. Holmes is engaged with the study of the sources of the various kinds of benzoin, and expects to be able before long to settle the exact botanical source of the Siam variety of this drug.

The past year's literature of adulteration will be found to embrace reports on scammony, Peruvian balsam, senega, pepper, saffron, Persian insect powder, and cochineal.

In a report on *Nerium odorum*, presented to the British Pharmaceutical Conference, H. G. Greenish describes a crystalline and an amorphous constituent, both of which were extracted from an aqueous percolate by means of chloroform. The nature of these substances is still under investigation. A communication to the same meeting by A. W. Gerrard deals with the odorous principle of henbane, isolated by him in the form of a pale yellow unctuous semi-crystalline mass. A considerable amount of attention has been devoted to the lily of the valley, *Convallaria majalis*, and to the study of its active principles, on account of the remarkable physiological action this plant has been found to exercise on the heart, an action probably not inferior to that of digitalis. Dr. M. Hay announces the isolation from *Cannabis Indica* of a crystallizable alkaloid possessing characters analogous to those of strychnine. *Thevetia Nereifolia*, from the kernels and bark of which Dr. de Vrij

has isolated a poisonous glucoside, is now shown by C. J. H. Warden to contain a second toxic principle of still greater activity. An examination of different varieties of kino, by A. Kremel, fails to confirm the presence therein of kinoin, the body discovered by Etti in 1872, and also throws doubt on the presence of pyrocatechin; but it establishes the presence of protocatechuic acid in all the samples. E. C. C. Stanford has examined a great number of specimens of cod-liver oil, and while confirming the presence of iodine in all the samples without exception, he finds this constituent in no case to exceed 0.000434 per cent., and therefore to fall considerably short of the proportion given in some well-known text books. The potato beetle, *Doryphora decemlineata* has been examined by J. T. Forbes, and found to contain a vesicating principle which can be extracted from it in the form of a dark oily fluid.

Besides the vegetable drugs already alluded to in this introductory chapter, a very large number of others have formed subjects of chemical, microscopical, or pharmaceutical research, a notice of which in this place must be omitted for want of space.

A. C. Abraham criticises the official process for the preparation of spirit of nitrous ether, and suggests an improved method consisting mainly in the distillation of a mixture of calcium nitrate, sulphuric acid, and rectified spirit, which he finds to furnish a more satisfactory product, and to combine the advantage of a greater yield with less cost and trouble. Dr. Thresh condemns the B.P. process for the preparation of aromatic spirit of ammonia, as yielding an exceedingly variable product, and proposes in its place a new formula, which directs the mixture of rectified spirit, water, and the oils of lemon and nutmeg, to be distilled, and the ammonium carbonate and strong solution of ammonia to be subsequently incorporated with the distillate. J. Casthelaz proposes to increase the stability of tincture of iodine by the addition of potassium iodate, which will prevent the formation of hydriodic acid. A more satisfactory syrup of phosphate of iron than that of the British Pharmacopœia may be prepared, according to D. Gorrie, by dissolving ferrous-sulphate in a solution of phosphoric acid, then adding barium carbonate, heating, filtering, and dissolving the sugar in the filtrate. The trouble and disadvantage of precipitating, washing, and draining a ferrous compound very prone to oxidation is thus completely obviated, and a product of definite composition and greater stability obtained. R. H. Davies and E. B. Schmidt call attention to the great variation in composition of commercial samples of Easton's Syrup, especially in the proportion of strychnine. The very unsatis-

factory nature of the officinal liquid extract of cinchona is again shown by Dr. B. H. Paul, whose observations fully confirm the unfavourable opinion expressed in reference to this preparation by C. Ekin in 1878. R. Aitken shows that in the preparation of extract of aloes the evaporation should be conducted by means of a current of warm air, as the use of the water-bath always yields a product more or less contaminated with inert resin. Dr. C. Symes describes a process for the preparation of a soluble essence from green ginger, which yields a very satisfactory product. Improved formulæ for the administration of phosphorus in the form of pills are recommended by H. H. Millhouse and A. Robbins. The usefulness of collodion for the topical application of medicaments is dwelt upon by J. B. Barnes in a recent communication to the British Pharmaceutical Conference. The suitability of sesame oil for pharmaceutical purposes is discussed both by M. Conroy and T. Maben, who express themselves favourably on its use for ointments in the place of olive and almond oil. In the opinion of the former, however, the large proportion of olein contained in this oil renders it unsuitable for plasters, liniments, and other preparations in which a combination takes place. The merits of lard, oil, wax, and mineral hydrocarbons as ointment bases are ably discussed in an interesting paper read at the Conference meeting by W. Willmott; while the comparative value of benzoin and styrax for the preservation of ointments forms the subject of a report by B. F. Scholl. In conclusion, we desire to call the reader's attention to an interesting paper by Prof. Quinlan, on the value of ensilage as a means of preserving medicinal herbs.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Note on the Reduction of Arseniates by means of Oxalic Acid. C. Patrouillard. (*Pharm. Journ.*, 3rd series, xiii. 362.) This is a rejoinder to a paper read by Naylor and Braithwaite at the Southampton Meeting of the British Pharmaceutical Conference, in which these two chemists dispute the power of oxalic acid to effect a reduction of arsenic acid previously asserted by the author (Abstract, *Year-Book of Pharmacy*, 1876, 101). While admitting that no such reduction takes place with free arsenic acid, the author re-asserts the reducing effect produced by oxalic acid on alkaline arseniates, on the strength of observations respecting the action of ammonium sulphhydrate on these salts after treatment with the acid named.

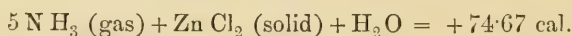
The Alleged Reduction of Arseniates by Oxalic Acid. W. A. H. Naylor and J. O. Braithwaite. (*Ibid.*, 464.) In reply to the second paper on this subject by C. Patrouillard (see preceding abstract), the authors state that they have re-investigated the alleged action of oxalic acid on arseniates, and have satisfied themselves that the reduction by means of this acid fails, not merely in the case of free arsenious acid, but also in that of alkaline arseniates. They do not regard the more or less speedy action of sulphuretted hydrogen on warm solutions of these compounds as a satisfactory means of judging whether or not any reduction has taken place.

Occurrence of Arsenic and Vanadium in Commercial Caustic Soda. E. Donath. (*Zeitschr. für Analyt. Chem.*, 1882, 404.) Caustic soda, like all direct or indirect products of the Leblanc process, is liable to be more or less contaminated with arsenic, emanating from arsenical pyrites.

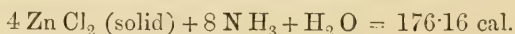
Recently the author examined a sample of commercial caustic

soda, the solution of which when saturated with sulphuretted hydrogen gas assumed an intense reddish violet coloration. A closer examination of the cause of this coloration revealed the presence of vanadium. The occurrence of this metal in caustic soda is confirmed by W. Fresenius.

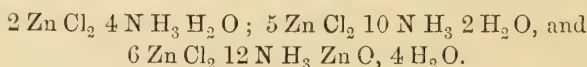
Ammoniacal Zinc Chlorides. G. André. (*Comptes Rendus*, xciv. 963-966, and *Journ. Chem. Soc.*, 1882, 1165.) If gaseous ammonia is passed into a solution of zinc chloride in cold concentrated ammonia, and the mixture is then heated until the crystalline precipitate is re-dissolved, the solution on cooling deposits large octahedral crystals, to which Divers assigned the formula $5 \text{ N H}_3 \text{ Zn Cl}_2 \text{ H}_2 \text{ O}$. This compound dissolves easily in a small quantity of water, but is decomposed on diluting the solution. Its heat of formation is—



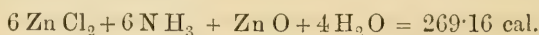
Kane's compound, $4 \text{ Zn Cl}_2, 8 \text{ N H}_3 \text{ H}_2 \text{ O}$, prepared by passing ammonia into a hot concentrated solution of zinc chloride, until the precipitate is redissolved, gave the following results:—



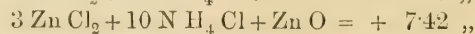
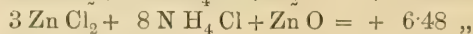
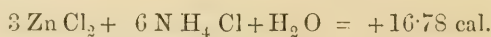
Other compounds obtained by the action of ammonia on zinc chloride under varying circumstances, have the composition—



The heat of formation of the last mentioned is—



Compounds of zinc chloride, ammonium chloride, and zinc oxide were also prepared, and their heats of formation determined as follows:—



The first compound crystallizes in large plates very soluble in water: the other two are also crystalline, but are decomposed by water. The author is studying the oxychlorides of zinc.

Purification of Metallic Zinc. Prof. Selmi. (*Chemiker Zeitung*, v. 934.) In order to free metallic zinc from arsenic the author recommends the addition of a lump of sal ammoniac to the metal previously melted in a crucible, and states that the whole of the arsenic is thus volatilized as tri-chloride.

Solubility of Lead Sulphate in Ammonium Citrate. S. Rovera. (*Chemiker Zeitung*, vi. No. 49.) In the presence of ammonium citrate lead is not precipitated by sulphuric acid, owing to the solubility of the sulphate in the alkaline citrate. It is, however, completely precipitated by alkaline carbonates.

Lead Iodides. M. Berthelot. (*Comptes Rendus*, xcv. 952-955. From *Journ. Chem. Soc.*) If lead iodide is dissolved in a hot concentrated aqueous solution of potassium iodide, the liquid on cooling deposits a pale yellowish crystalline salt, of the composition $\text{PbI}_2, 2\text{KI}, 2\text{H}_2\text{O}$. At a lower temperature, or by a gradual evaporation of the mother-liquor in the cold, long pale yellow needles are obtained of the composition $4\text{KI}, 3\text{PbI}_2, 6\text{H}_2\text{O}$. These salts combine together, forming intermediate compounds. The heat of formation of these double salts was determined by treating them with a large quantity of water. The following results were obtained:—

	Develops
$2 \text{ KI, Pb I}_2 + 2 \text{ H}_2\text{O liquid} = 2 \text{ KI, Pb I}_2, 2 \text{ H}_2\text{O, crystallized,}$	+ 4.62 cal.
" " solid = " " " "	+ 1.76 "
$2 \text{ KI} + \text{Pb I}_2 + 2 \text{ H}_2\text{O solid} = 2 \text{ KI, Pb I}_2, 2 \text{ H}_2\text{O}$	" + 2.58 "
$2 \text{ KI} + \text{Pb I}_2 = 2 \text{ KI, Pb I}_2 \text{ anhydrous}$. . .	" + 0.84 "
$4 \text{ KI, 3 Pb I}_2 + 6 \text{ H}_2\text{O liquid} = 4 \text{ KI, 3 Pb I}_2, 6 \text{ H}_2\text{O}$	" + 12.36 "
" " solid = " " " "	" + 3.8 "
$4 \text{ KI} + 3 \text{ Pb I}_2 + 6 \text{ H}_2\text{O solid} = 4 \text{ KI, 3 Pb I}_2, 6 \text{ H}_2\text{O}$	" + 2.8 "
$4 \text{ KI} + 3 \text{ Pb I}_2 = 4 \text{ KI, 3 Pb I}_2$	" - 1.0 "

The formation of the first salt is exothermic in both the hydrated and anhydrous condition, whereas the formation of the second salt is exothermic in the hydrated condition only.

A cold saturated solution of lead iodide yields an immediate precipitate on addition of a few drops of a dilute solution of potassium iodide or hydriodic acid. Solution of lead bromide, on the other hand, is precipitated by hydrobromic acid, but not by soluble bromides; and solution of lead chloride is precipitated by hydrochloric acid, but not by soluble chlorides.

Action of Potash on Lead Oxide. A. Ditte. (*Comptes Rendus*, xciv. 1310-1313; *Journ. Chem. Soc.*, 1882, 927.) When potash solution is added, with continual agitation, to lead hydrate, $\text{Pb H}_2\text{O}_3$, suspended in water at 25° , the amount of lead oxide dissolved increases with the quantity of alkali added, until the latter amounts to 300 grams per 1,000 grams of water. At this point the amount of lead oxide dissolved decreases slightly, but afterwards increases as

more alkali is added, and at the same time the amorphous hydrate is converted into transparent microscopic crystals. When the quantity of potash added reaches 400 grams per 1,000 grams of water, the amount of lead oxide dissolved again suddenly diminishes, but afterwards increases as more and more potash is added. The hydrate, $\text{Pb}(\text{H}_2\text{O})_2$, dissolves at first in the dilute potash solution; but as the concentration of the latter increases, it is converted into the hydrate, $3\text{PbO}, \text{H}_2\text{O}$, and this in its turn is converted into the anhydrous oxide when the concentration of the potash passes a certain point. The same changes take place at all temperatures, but more readily the higher the temperature. The hydrate, $3\text{PbO}, \text{H}_2\text{O}$, separates out in the form of transparent, white, flattened hexagonal prisms (sp. gr. at $0^\circ = 7.592$), when a solution of potash containing 100–300 grams per 1,000 grams of water is saturated with lead hydrate at a temperature insufficient for its decomposition, and allowed to cool.

The anhydrous oxide is obtained in several different forms, depending on the temperature and the degree of concentration of the potash solution. When the hydrate is heated with a solution of about 130 grams of potash in 1,000 grams of water, the oxide is obtained in small plates, with a greenish yellow tinge; sp. gr. at $0^\circ = 9.1699$. With 230 grams potash in 1,000 grams water, the oxide forms brilliant sulphur-yellow crystals; sp. gr. at $0^\circ = 9.2089$. With 300 grams potash in 1,000 grams water the oxide separates out on cooling in small, compact, heavy brownish yellow needles; sp. gr. at $0^\circ = 9.8835$. If potash is added gradually to lead hydrate suspended in water at 20° until it amounts to 400 grams per 1,000 grams of water, the anhydrous lead oxide separates out after several days in the form of a hard, compact greyish green crust, composed of large brilliant laminae; sp. gr. at $0^\circ = 9.5605$. When a hot solution of 185 grams potash in 1,000 grams water is saturated with lead oxide, the latter separates out on cooling in long dark green, almost black, needles; sp. gr. at $0^\circ = 9.4223$.

All these different varieties of the oxide are formed of small thin, transparent crystals, the colour varying with the thickness of the plates, which are rhombic, the ratio of the diagonals being about 1 : 3. All the crystals become red when heated, and sulphur-yellow on cooling; their sp. gr. increases the more they are heated.

When lead hydrate is boiled with a saturated solution of potash, it is converted into deep rose-coloured plates, which are also formed under certain other circumstances. These crystals are either thin square tables or combinations of the cube with the octahedron;

sp. gr. at 0° = 9.3757. They become yellow on cooling after being heated.

It is evident that anhydrous lead oxide, PbO , exists in two distinct crystalline forms, *i.e.*, in distinct isomeric modifications similar to those which Berthelot has observed in the case of haloïd silver salts and some other compounds.

Reactions of Mercuric Chloride. H. Debray. (*Comptes Rendus*, xciv. 1222-1224. From *Journ. Chem. Soc.*) Mercuric chloride, as is well known, is reduced to mercurous chloride by sulphurous acid, especially on heating. If, however, sodium chloride is present in quantity about twenty-five times as great as the mercuric chloride, no reduction takes place even on boiling the liquid. This cannot be explained by the assumption that the double sodio-mercuric chloride is unattached by sulphurous acid; for Berthelot has shown that the formation of the double chloride is accompanied by a development of heat less than 1 cal., whereas the reduction of mercuric chloride by sulphurous acid develops + 14.7 cal. If the mixture of sulphurous acid and chlorides is heated in a sealed tube at 120° , a crystalline precipitate of mercurous chloride is slowly formed. That no reduction takes place when the liquid is boiled under ordinary pressure is proved by the fact that the addition of potash, after expulsion of the sulphurous anhydride, produces a yellow precipitate of mercuric oxide, without any trace of mercurous oxide.

When potash or soda is added in excess to a solution of mercuric chloride, mixed with a large quantity of sodium chloride, no oxy-chlorides are formed, and there is no immediate precipitate, but after a short time mercuric oxide is deposited in a crystalline form. The crystals are transparent and are denser than the ordinary precipitated oxide. If precipitated in the cold they are yellow, but if precipitated from a boiling solution they have a red colour, similar to that of the oxide prepared by igniting the nitrate. The red precipitated oxide is not attacked by dry chlorine; the yellow crystalline variety is attacked, but very much more slowly than the amorphous yellow variety.

Mercurous Chromates. P. and M. M. Richter. (*Ber. der deutsch. chem. Ges.*, xv. 1489-1492, and *Journ. Chem. Soc.*, 1882, 1029.) Normal mercurous chromate, Hg_2CrO_4 , is reconverted by the action of alkalies into a black substance the composition of which, according to the authors' analyses, is represented by the formula $3\text{Hg}_2\text{O}, \text{CrO}_3$. The product of the reaction of mercurous nitrate and potassium monochromate is always the normal

mercurous chromate, and not the compound $4\text{Hg}_2\text{O}, 3\text{CrO}_3$, as stated by Gmelin; the formation of a compound of this, or of any composition differing from the normal, is considered by the authors as due to impurities, probably to nitrite in the mercurous nitrate.

The action of ammonia on the chromates takes place in two directions, according to the solubility or insolubility of the hydroxides of their basyls.

(1) In the former case the ammonia enters the molecule to form a crystalline metallammoniochromate, *e.g.*, Cu, Ni, Co, Ag, Zn, Cd.

(2) In the case of metals whose hydroxides are insoluble in ammonia, *e.g.*, Pb, Fe, Hg, Au, Pt, Bi, V, Ce, Di, La, the ammonia simply decomposes the chromates, with formation of ammonium chromate.

The decomposition of mercurous chromate by potassium cyanide (solution) is represented by the equation—



When the mercurous salt is in excess, however, mercurous cyanide appears to be formed as a dark green amorphous precipitate, but is very unstable. From the solution containing excess of potassium cyanide, the double salt, $3\text{Hg}(\text{CN})_2, 2\text{K}_3\text{CrO}_4$, crystallizes in plates after a time. The mercury which is formed according to the above equation is a black precipitate, which may be employed for “silvering” glass; if it is spread over a glass plate and the water allowed to evaporate, a coherent film of metal is obtained.

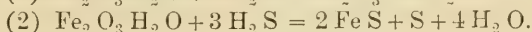
Neutral Aluminium Sulphate. P. M. Dalacharlonny. (*Comptes Rendus*, xcvi. 844.) The author has shown that pure aluminium sulphate, $\text{Al}_2(\text{SO}_4)_3$, contains 16 molecules of water of crystallization, and not 18, as stated in the text-books. It crystallizes in flat ortho-rhombic prisms, which are not hygroscopic, but liable to efflorescence. The native sulphate found by Boussingault on the Rio Saldana has the same composition. Impure aluminium sulphate, contaminated with ferric sulphate, is, however, hygroscopic, and contains at least 18 molecules of water, and generally even more.

Notes on Hydrated Ferric Oxide and its Behaviour with Sulphuretted Hydrogen. L. T. Wright. (*Pharm. Journ.*, from a paper read before the Chemical Society, Feb. 1st, 1883.) The author endeavoured to prepare hydrated ferric oxide by precipitating the chloride with ammonia, but could not succeed in preparing it free from basic chloride. In order to avoid the inconvenience of handling a bulky gelatinous precipitate, the following method was tried:

ferric chloride solution was added slowly to an excess of ammonia, and the whole evaporated to dryness at 100° . The reddish brown mass, on treatment with water, fell into an impalpable powder, which for the most part passed through many filter papers. The filtrates were turbid and of a bright red colour. In this condition the precipitate is probably similar to the so-called "colloidal ferric hydrate." The ferric hydrate in this condition is not blackened by sulphuretted hydrogen. Recently precipitated ferric hydrate is blackened at once by sulphuretted hydrogen, and the sulphide thus formed is completely soluble in excess of potassium cyanide,—



Two equations are given in text-books to express the reaction of sulphuretted hydrogen upon hydrated ferric oxide,—



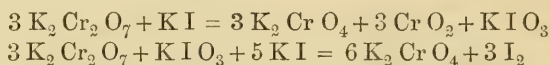
The author has studied the reaction, estimating the sulphur and the water formed.

Use of Chromium Phosphate in Analysis and in the Arts. A. Carnot. (*Comptes Rendus*, xciv. 1313–1315. From *Journ. Chem. Soc.*) If a boiling, feebly acid solution of a chromium salt is mixed with sodium acetate and an excess of alkaline phosphate, the whole of the chromium is precipitated in the form of a green hydrated phosphate. This method is applicable to both the green and violet chlorides and sulphates, and to the acetates, but not to the oxalates. It answers equally well with alkaline chromates, if sodium thio-sulphate is added with the alkaline phosphate, and the liquid boiled for about an hour. In this case the precipitate is mixed with a little sulphur derived from the thiosulphate. The precipitated phosphate has a green colour, and when dried at 100° has the composition $\text{Cr P O}_4, 3 \text{H}_2 \text{O}$. It may be washed with boiling water, in which it is almost insoluble; or better, first with a warm solution of ammonium acetate, to remove alkaline salts, and then with a solution of ammonium nitrate, to remove the organic acid. On ignition the phosphate becomes grey, and has the composition Cr P O_4 . To separate chromium from aluminium, the former is first converted into alkaline chromate, and the aluminium precipitated as phosphate. The filtrate is then mixed with sodium thio-sulphate and boiled, more alkaline phosphate being added if necessary. The chromium is thus precipitated as phosphate. This method is rapid and gives accurate results. It is applicable in

presence of chlorides and sulphates, and in this respect has the advantage over other methods.

The precipitated phosphate retains its somewhat beautiful green colour when dried, and may therefore be used as a paint instead of other greens, which may contain poisonous metals. It may also be employed in dyeing, since it can readily be precipitated on the fibres of the cloth.

Action of Potassium Bichromate on Potassium Iodide. M. Richter. (*Zeitschr. für Analyt. Chem.*, 1882, 368.) Some time ago it was stated by E. Donath, that while free chromic acid readily liberates iodine from potassium iodide, bichromates are without action on this salt, and that consequently potassium iodide might be employed for the detection of uncombined chromic acid in the simultaneous presence of chromates and bichromates (Abstract, *Year-Book of Pharmacy*, 1879, 139). The author's experience is in direct contradiction to this statement. His results show that the iodide is completely though slowly decomposed by pure potassium bichromate, the reaction taking place in two stages, expressed by the following equations:—



The reaction takes place instantaneously instead of slowly, if some potassium iodate be used along with iodide.

As mono-chromates produce no effect upon iodides, this reaction may be used for the detection of bichromates in these salts.

Alkaline Reaction of Potassium Chromate. M. Richter. (*Zeitschr. für Analyt. Chem.*, 1882, 204 and 372.) The alkaline reaction of yellow potassium chromate may be due to three causes: it may be ascribed to impurities derived from the methods of preparation, to the chemical nature of the salt, or to the oxidizing power of chromic acid. Potassium chromate six times recrystallized from water, and precipitated by alcohol, did not lose its alkaline reaction. Its solution gave with turmeric a strong brown, with red litmus paper a bluish green coloration, but was without action on phenolphthalein. The author concludes that the chromic acid oxidizes the colouring matters of litmus and turmeric, free alkali being formed, while no action takes place on phenolphthalein.

In reference to a statement made by F. Mohr, that potassium chromate, when heated with ammonium chloride, liberates ammonia, and should therefore be considered as a basic salt, the dichromate being the really neutral salt, the author believes that the slight

evolution of ammonia which actually takes place is simply due to the dissociation of the ammonium chromate which is formed, crystals of this salt giving off ammonia even at ordinary temperatures.

Chromates. M. Prudhomme and F. Binder. (*Bull. de la Soc. chim.* [2], xxxvii. 194-196.) When a solution of potassium bichromate is mixed with a solution of a barium salt, neutral barium chromate is precipitated and chromic acid liberated. This reaction, together with the fact that many bichromates can be prepared by the direct action of chromic anhydride on an equal molecular weight of the corresponding normal chromate, confirms the view that potassium bichromate is a molecular combination of the mono-chromate, with an easily displaceable molecule of chromic anhydride. The author mentions several other reactions, all tending to furnish additional evidence in support of this view.

Neutral Phosphates of the Alkalies. E. Filhol and Senderens. (*Bied. Centr.*, 1882, 641.) If phosphoric acid be carefully neutralized with sodium hydrate, the mixture is found to affect both blue and red litmus paper, and to yield upon evaporation crystals consisting of equal molecular weights of mono- and di-sodium phosphate. Neutral potassium or ammonium phosphates have not been obtained in crystals, while potassio-sodium and sodio-ammonium phosphates crystallize readily.

Neutral Arseniates. E. Filhol and Senderens. (*Comptes Rendus*, Aug. 14th, 1882.) The authors have obtained crystals of sesqui-sodium arseniate, and also of double arseniates of sodium and ammonium, and of sodium and potassium, corresponding in their composition to the phosphates mentioned in the preceding abstract. Here also they failed to obtain the corresponding salt of potassium as well as that of ammonium.

Action of Ozone on Metallic Salts and Oxides. M. Mailfert. (*Comptes Rendus*, xciv. 360-363, and *Journ. Chem. Soc.*, 1882, 1161.)

Mercurous Salts.—The *nitrate* is entirely decomposed by ozone, with formation of mercuric nitrate and a yellow precipitate of trimercuric nitrate. The *sulphate* behaves in a similar manner, mercuric sulphate and basic sulphate being formed. Mercurous *chloride* is acted on somewhat more slowly, with formation of mercuric chloride and a brick-red precipitate, apparently an oxy-chloride. The *bromide* is acted on in a similar way. With the *iodide* the action is extremely slow, mere traces of red precipitate being produced even after the ozonised gas had been passed for fifteen hours.

Silver Salts.—With the *nitrate*, a bluish black flocculent precipitate of peroxide is produced, which, however, is decomposed and redissolved on agitating the solution. The *sulphate* likewise yields peroxide, but the *chloride* and *cyanide* are only very slowly acted on.

Palladium Salts.—The nitrate, chloride, and protoxide yield the dioxide by the action of ozone. The protoxide, in presence of potassium hydroxide, gives potassium palladate.

Cobalt and Nickel Salts.—The sulphates, nitrates, and chlorides, are but slowly attacked. The protoxides, on the other hand, are easily converted into the peroxides.

Lead Salts.—All the basic salts yield lead peroxide, as do many of the neutral salts; the chloride, nitrate, oxalate, and phosphate, however, are but very slowly acted on. Lead oxide is also changed into peroxide by ozone; in presence of potassium hydroxide it gives potassium plumbate.

Manganese Salts.—All the manganese salts, in moderately concentrated solution, give a brown or black precipitate, consisting of the hydrated dioxide if the ozone is in excess, and of a lower oxide if it is not. In the former case a violet solution, containing permanganic acid, is frequently produced. If excess of ozone acts on a very dilute solution of a manganous salt (in 30,000 to 60,000 of water), a brown dichroic solution is obtained, which slowly decomposes after a time, depositing a rusty brown precipitate, and leaving permanganic acid in solution.

Chromium Salts.—The sulphate, chloride, and oxide all yield chromic acid. If ether is present, perchromic acid is formed.

Bismuth oxide gives bismuthic acid, and in presence of potassium hydroxide potassium bismuthate.

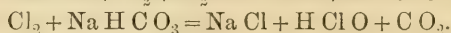
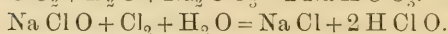
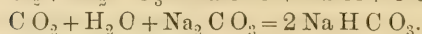
Iron sesquioxide is not acted on by ozone, but in presence of potassium hydrate it yields potassium ferrate.

The Action of Chlorine on certain Metals. R. Cowper. (*Pharm. Journ.*, from a paper read before the Chem. Soc., Feb. 1st, 1883.) As previously noticed by Wanklyn, dry chlorine is quite unable to act upon metallic sodium. The author finds that chlorine which has been perfectly dried by long contact with fused calcium chloride is without action on Dutch metal foil; on introducing a minute quantity of water the ordinary reaction ensues immediately. Similarly, zinc foil and magnesium are not attacked. Silver and bismuth are tarnished very slowly. Tin foil, arsenic, and antimony are attacked immediately. The author remarks that these three metals all form chlorides which are liquid at ordinary temperatures.

Chlorine, whether dry or moist, attacks mercury. If dried chlorine be passed over a piece of potassium, the latter catches fire; this is probably caused by the envelope of hydrate. Potassium was sealed up in a tube containing dry air; the tube was then heated until all the oxygen was absorbed and a bright surface of potassium obtained; the tube was then filled with chlorine. The surface of the metal became slowly covered with a deep purple film, and the potassium finally ignited when heated considerably above its melting point.

Constitution of "Liquor Sodæ Chloratæ." W. R. Dunstan and F. Ransom. (*Pharm. Journ.* 3rd series, xiii. 667, 668.) This preparation is generally supposed to contain sodium hypochlorite, chloride, and bicarbonate; but some observations made by Williamson, as well as the results of the authors' experiments, tend to prove that it contains free hypochlorous acid, and not sodium hypochlorite. This acid can be extracted from the liquid by means of ether, and readily recognised in the ethereal solution. The residual liquid, after extraction with ether, contains sodium chloride and bicarbonate. Some commercial samples of the liquor were found to contain sodium hypochlorite and chloride, together with traces of lime, but no free hypochlorous acid, which composition indicated that they had been made by decomposing chlorinated lime with sodium carbonate, instead of by the official process.

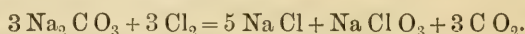
Action of Chlorine on Solutions of Sodium Carbonate. W. R. Dunstan and F. Ransom. (*Pharm. Journ.*, 3rd series, xiii. 668, 669.) The authors observations respecting the composition of the official *liquor sodæ chloratæ* (preceding abstract) induced them to study more closely the action of chlorine upon solutions of sodium carbonate. Before an excess of chlorine has been used, and while the liquid is still alkaline, it contains no free hypochlorous acid, but sodium hypochlorite in quantities varying with the amount of chlorine used. The gas evolved consists of chlorine and carbonic anhydride. In the next stage of the process carbonic acid gas is given off, and the liquid contains both sodium hypochlorite and free hypochlorous acid. The further introduction of chlorine yields a solution of sodium chloride and free hypochlorous acid and sodium bicarbonate, containing, however, no sodium hypochlorite. Beyond this point, carbonic acid is given off with effervescence, and if the treatment with chlorine is continued until this effervescence ceases, the solution contains hypochlorous acid, sodium chloride, and some sodium chlorate. The successive changes are explained by the following equations:—



The final formation of chlorate occurs in accordance with the following:—



If the process be conducted at the boiling point the products are sodium chloride and chlorate,—



Formation of Hypochlorites and Chlorates from Chlorides by the Action of the Electric Current. A. Lidoff and W. Tichomirow. (*Journ. Russ. Chem. Soc.*, 1882, 212. From *Journ. Chem. Soc.*) The decomposition of solutions of halogen salts of alkali-metals under the influence of the voltaic current, has been studied since 1851 by Watt, who proposed to prepare chlorine and hydrogen by the electrolysis of a solution of potassium chloride, acidulated by sulphuric acid. In order to accelerate the reaction, different salts were added by Dixon in 1862. In 1872 Fitzgerald and Molloy used for the same purpose carbon electrodes, which were previously dipped into paraffin. In 1879 Gluckoff and Waschtschuk applied the chlorine evolved in this process for the formation of a gas battery, which would strengthen the action of the main current. The last experiments in this direction were made by Kozloffsky and Lazareff, in 1880 and 1881. In all the above experiments the alkaline residue was worked up for soda crystals or sodium hydrate, the chlorine for bleaching powder or alkaline hypochlorite.

The authors investigated the action of the silent discharge, or of the voltaic current between carbon electrodes, generated by a Gramme engine, upon solutions of the chlorides of sodium, potassium, and calcium. As the chlorine evolved in this process is extremely active, it was improbable that it would escape in large quantities from the liquid. The ordinary voltaic current was replaced by the silent discharge as soon as the liquid began to get warmer. The evolution of chlorine, which was somewhat energetic in the beginning of the experiment, ceased almost entirely after a short time. On using sodium or potassium chloride, the liquid contained, besides chlorine, salts of hypochlorous acid, as was proved by many reactions, and of chloric acid, which was detected after the complete destruction of the hypochlorite by boiling or

addition of ammonia, which according to Kolb destroys hypochlorites on application of a moderate heat. Some of the potassium chlorate thus formed could even be separated in crystals.

The formation of bleaching liquor from a solution of calcium chloride went on much more slowly than in the case of chlorides of alkali-metals, partly owing to the greater resistance in the interior of the liquid. The best yield is obtained from a neutral solution at a temperature of 60° ; from an acid solution much free chlorine was evolved.

In order to study the further effect of the current on hypochlorites, which are formed in the above reaction, two litres of a solution of bleaching powder, containing 8.25 grams of available chlorine in 100 c.c., were electrolysed. After two hours this amount diminished to 8.07 grams, and after two hours more to 7.75 grams, so that the total percentage loss of the amount of active chlorine was 6.06. The destructive action of the current on hypochlorites is therefore but very small. Though a rapid evolution of gas had taken place during the above experiments (about 6 litres were collected), the quantity of chlorine contained in them, or in the wash-water, was very small, not exceeding a few milligrams.

The authors explain the formation of hypochlorites in the above cases by the action of nascent chlorine on the alkalis, which are formed from the metals separated at first, by their immediate contact with water. They further assume that the chlorates are formed from the hypochlorites by the action of heat, thus :—



The best results were obtained with a cold saturated solution of sodium chloride, then comes potassium chloride, whilst calcium chloride gives the smallest yield. The carbon electrodes were very soon disintegrated.

The authors hope that they may succeed in utilising the chlorine which becomes valueless, in the form of calcium chloride, in Solvay's soda process, by converting it into its oxygen compounds. For this purpose they are at present engaged in more completely investigating the nature of the decomposition.

Alkaline Hyposulphites. M. Berthelot. (*Comptes Rendus*, xcvi. 146.) The author has determined the decomposition products of alkaline hyposulphites by titrating the heated salt with iodine. As the decomposition occurs in accordance with the equation :—



it follows that the completely decomposed salt requires exactly half as much iodine as the anhydrous undecomposed hyposulphite. The decomposition of the potassium salt begins at 430° C., and that of the sodium salt at 400° ; in both cases it is thoroughly completed at 470° in a short time.

Manganese Sulphite. A. Gorgeu. (*Comptes Rendus*, xcvi. 341.) This salt crystallizes at an ordinary temperature with 3 molecules of water, but from hot solutions with 1 molecule only. It is pink, becomes anhydrous at 150° C., and is soluble in 10,000 parts of cold and in 5,000 parts of boiling water, but readily soluble in water saturated with sulphurous acid. It is rapidly oxidized on exposure to air. When heated in the absence of air it splits up into sulphate, sulphide, oxide, and sulphurous anhydride. It readily combines with alkaline sulphites.

Potassium Sesquicarbonate. C. Rammelsberg. (*Ber. der deutsch. chem. Ges.*, xvi. 273.) By the evaporation and crystallization of large quantities of solutions of potassium bicarbonate, Bauer has obtained a salt which neither deliquesces nor effloresces. The author's analysis, as well as those of Bauer, show this salt to be a sesquicarbonate of the formula $2 K_2CO_3, H_2CO_3 + 3 H_2O$.

New Compounds of Ammonia with Nitric and Acetic Acids, L. Troost. (*Comptes Rendus*, xciv. 789-792, and *Journ. Chem. Soc.*, 1882, 1162.)

Combinations of Nitric Acid with Ammonia.—Divers observed that ammonium nitrate was capable of absorbing a large amount of dry gaseous ammonia, forming a compound varying in composition with the temperature and pressure at which the experiment was made. By observing, however, the tension of the gas emitted by this compound, as in the case of the compound of the halogen hydrides with ammonia, the author has established the existence of a compound, $2(NH_4NO_3) + 3NH_3$. It is solid at a low temperature, and melts to a mobile liquid at -22° , the tension of dissociation at -30° is 90 mm. Indications of the existence of a compound, $NH_4NO_3 + 3NH_3$, were also obtained.

Combinations of Acetic Acid with Ammonia.—Two compounds of ammonia with acetic acid have been obtained of the formula $NH_4OAc + 3NH_3$ and $NH_4OAc + 6NH_3$; both crystallize in thin rhomboidal plates, but the first melts at -18° , and the second at -32° . This tension of dissociation, taken above their fusion points, is constant for the same temperature, and increases rapidly as the temperature rises.

Ammonium Bisulphide and Ammonium Cyanide. M. Isambert. (*Comptes Rendus*, xciv. 958-960.) In a mixture of sulphuretted hydrogen, and ammonia gases, each gas exercises the same pressure, whether it be free or combined, and therefore the pressure of one of the gases is inversely as the pressure of the other. In a mixture of hydrocyanic acid and ammonia, the tensions of the hydrocyanic acid and of the ammonium cyanide regularly increase with the temperature; the tensions of the cyanide, in presence of an excess of hydrocyanic acid, are the same as those of hydrocyanic acid; and in presence of an excess of ammonia gas, the tensions of hydrocyanic acid follow the same law as that enunciated for ammonium sulphide. But the seeming confirmation of Engel and Moitessier's law is merely the consequence of a species of compensation; and in all cases just conclusions as to what occurs in a mixture of vapours of different kinds can only be drawn from the results of analysis.

Solubility of Mixtures of Salts of the Alkalies and Alkaline Earths. H. Precht and B. Wittgen. (*Ber. der deutsch. chem. Ges.*, xiii. 1666-1672, and *Journ. Chem. Soc.*, 1882, 1264.) The following results were obtained by treating a mixture of 210 grams K_2SO_4 and 322 grams NaCl with an insufficient quantity of water for complete solution:—

t° .	100 parts of the Saturated Solution contain			100 parts of Water dissolve		
	NaCl.	K_2SO_4 .	KCl.	NaCl.	K_2SO_4 .	KCl.
10°	23.1	5.6	2.2	33.43	8.10	3.18
20	23.3	6.1	2.1	34.01	8.90	3.06
30	23.5	6.5	2.0	34.56	9.56	2.95
50	23.9	7.4	1.9	35.77	11.07	2.84
80	23.5	8.0	3.3	36.04	12.26	5.06
100	22.7	8.0	5.6	35.63	12.56	8.79

Solubility and Degree of Decomposition of Magnesium Potassium Sulphate.

t° .	100 parts of Saturated Solution contain		Ratio between the molecules of K_2SO_4 and $MgSO_4$ in the solution.	100 parts of Water dissolve	
	K_2SO_4 .	$MgSO_4$		K_2SO_4 .	$MgSO_4$.
10°	9.4	9.8	1 : 1.52	11.63	12.13
20	10.9	10.8	1 : 1.43	13.92	13.79
30	12.4	11.8	1 : 1.38	16.36	15.56
50	14.7	14.8	1 : 1.46	20.85	20.99
70	15.6	16.8	1 : 1.52	23.07	24.85

Solubility of a Mixture of Potassium Magnesium Sulphate, and Sodium Chloride.

100 parts of the Saturated Solution contain

<i>t</i> °.	NaCl.	K ₂ SO ₄ .	MgSO ₄ .	MgCl ₂ .
10°	20·85	7·25	5·07	—
25	20·67	8·50	6·05	—
35	19·40	9·60	7·01	0·18
55	18·65	12·89	8·64	0·45
65	19·64	12·32	6·90	0·71
80	15·50	14·30	4·70	4·20
100	14·42	13·49	5·62	5·35

New Method of Preparing Hyponitrites. W. Zorn. (*Ber. der deutsch. chem. Ges.*, xv. 1258.) Ferrous sulphate is precipitated with milk of lime; the thick paste of ferrous hydrate and calcium sulphate is then added to a solution of sodium nitrite, and the whole mixture is left in a cool place; the solution is filtered, and the filtrate, after neutralization with acetic acid, is precipitated by silver nitrate, which throws down pure silver hyponitrite. From 1 kilo. of ferrous sulphate and 100 grams of nitrite about 10 grams of the silver salt were obtained.

Purification of Carbon Bisulphide. E. Obach. (*Journ. pr. Chem.* [2], xxvi. 281–307.) Effectual purification is obtained by first filtering the bisulphide through a dry paper filter to separate water and dirt, distilling from quick lime, treatment of the distillate with about 5 grams per litre of dry powdered potassium permanganate, then with metallic mercury until all free sulphur has combined, and lastly with mercuric sulphate. The bisulphide is then redistilled from calcium chloride, and must be kept in the dark.

Action of Bromine on Carbon Bisulphide. C. Hell and F. Urech. (*Ber. der deutsch. chem. Ges.*, xv. 987–994.) The authors have further studied the formation of the crystalline compound, C₂S₃Br₆, previously obtained by them by the action of bromine on carbon bisulphide. They find that the action is not instantaneous, but requires several days; that a temperature of 100° not only impedes the velocity of the reaction, but also diminishes the quantity of the product; and that a mixture in the proportion CS₂ : 2 Br₂ reaches its reaction limit in the shortest time. Various tables, showing the products under different conditions, are given in the memoir.

Hypophosphoric Acid. I. Corne. (*Journ. Pharm. Chim.* [5], vi. 123, 124, and *Journ. Chem. Soc.*, 1882, 1264.) Hypophosphoric acid, P₂O₄, 2 H₂O, is prepared as follows:—A glass flask of about

3 litres capacity is closed with a cork, in which is inserted a tube bent at right angles, and is about half filled with a solution of copper nitrate. To this is added 30–40 grams of phosphorus, and the flask is placed up to the neck in a water-bath, the temperature of which is gradually raised to 100°. A mixture of copper and copper phosphide is soon precipitated, which, when the temperature has reached 75°, rises to the surface of the liquid and absorbs oxygen from the air, and a rapid and regular decomposition of the copper nitrate sets in. Twelve grams of phosphorus are added from time to time (without removing the flask from the water-bath) until the colour of the solution has disappeared. The hypophosphoric acid is freed from the phosphoric acid and ammonia which is formed by saturating one half the acid present with sodium carbonate. After a time sodium hypophosphate separates, and is purified by recrystallization. By converting this into the lead salt and decomposing it with sulphuretted hydrogen, the free acid may be obtained.

Preparation of Pure Hydrochloric Acid. Dr. Giudice. (*Chemiker Zeitung*, 1882, vi. No. 49.) The sulphuric acid to be employed is mixed before use with a little potassium permanganate, and the hydrochloric acid gas, before being passed into water, is conducted through a bulb-tube containing mercury. The permanganate prevents the formation of any sulphurous acid, while the mercury absorbs free chlorine and decomposes any chloride of arsenic contained in the gas.

Purification of Hydrochloric Acid. R. Bensemann. (*Répert. Anal. Chem.*, iii. 34, 1883.) The commercial acid is freed from arsenic and from sulphurous acid by diluting it to 1.12 sp. gr. and distilling with the addition of a little potassium chlorate.

Non-existence of Pentathionic Acid. W. Spring. (*Annalen*, cccxiii. 329–363, and *Journ. Chem. Soc.*, 1882, 1262.) By the action of S_2Cl_2 on potassium sulphite, tetrathionate and trithionate are obtained; and by its action on potassium thiosulphate, tetrathionate is formed, some sulphur separating. The formation of trithionate in the first case is due to a reaction between potassium sulphite and tetrathionate, yielding trithionate and thiosulphate.

The author made numerous experiments which fully confirm his previous statement that Wackenroder's solution, when prepared with excess of sulphurous anhydride, has the power of decolorizing indigo; hydrogen disulphide acting on a solution of sulphurous acid, yields tetrathionic acid, sulphur, and a liquid which decolorizes indigo; liquids which decolorize indigo are also obtained by the

action of sulphurous acid on sodium thiosulphate and of dilute sulphuric acid on potassium thiosulphate. Potassium hyposulphite, K_2SO_3 , is rapidly destroyed by hydrogen sulphide; as Takamatsu and Smith added hydrogen sulphide until the smell of sulphurous anhydride was no longer perceptible, this reaction probably accounts for their failure to obtain the indigo decoloration. Hypo-sulphites do not combine directly with sulphur.

The main portion of the paper is devoted to a criticism of the results of Stingl and Morawski, Kessler, and of Takamatsu and Smith. The author contends that the substance called pentathionic acid is a solution of sulphur in tetrathionic acid, basing his arguments on the following grounds:—That tetrathionic acid readily dissolves sulphur; that sulphur is precipitated by the action of hydroxides and carbonates; that the excess of sulphur can be removed by agitation with metals or lead peroxide; and finally, that all the analyses as yet published (fifty in number) for pentathionic acid, free, or as salts, show an indefinite composition, the ratio of hydrogen to sulphur varying from 2 : 3.505 to 2 : 5.23, the mean of the whole being 2 : 4.506, and only two analyses out of the fifty giving the ratio 2 : 5.

The author has repeated the experiments of Lewes, but has only obtained salts containing an amount of sulphur intermediate between that required for tetrathionate and pentathionate; the salts had an acid reaction, and were either acid salts or contained free acid.

Composition of Hydrated Carbonic Acid. S. Wroblewski. (*Comptes Rendus*, xciv. 954–958.) At a temperature of 0° C. and under a pressure of about 16 atmospheres, carbonic anhydride is found to combine with water to form a hydrate of the composition $CO_2 + 8H_2O$.

Law of Solubility of Carbonic Anhydride in Water at High Pressures. S. Wroblewski. (*Comptes Rendus*, xciv. 1355–1357, and *Journ. Chem. Soc.*, 1882, 1021.)

1. The temperature remaining constant, the co-efficient of saturation, *i.e.*, the volume of gas (taken at 0° and 760 mm. pressure), dissolved in 1 c.c. water, increases less rapidly than the pressure, although tending to a definite limit.

2. The pressure remaining constant, the co-efficient of solubility increases as the temperature decreases.

These laws, which are supported by a table detailing the author's results, are not in accordance with the results of Khanikoff and Louguinine, who found that under a pressure of four atmospheres

the solubility increased at a slightly greater rate than the pressure ; but this incorrect conclusion is due to a double error in the method of calculation employed. When this error is corrected, the results fully confirm the above laws. A certain relation exists between the laws of solubility and the formation of the hydrate $\text{C O}_2 + 8 \text{ H}_2 \text{ O}$ (discovered by the author), which make it probable that the conditions for the formation of the hydrate $\text{C O}_2 + \text{H}_2 \text{ O}$ can never be realized.

It is evident that a hydrate can only be formed under pressure when the water contains in solution a sufficient quantity of the gas to form that hydrate. In the case of $\text{C O}_2 + 8 \text{ H}_2 \text{ O}$, the co-efficient of solubility $S=155$; at 30 atmospheres, $S=33.74$, and on increasing the pressure the gas liquefies, and the two liquids evaporate ; but on lowering the temperature of the gas in contact with the water (probably until it reaches the temperature at which its solubility corresponds with the composition of the hydrate), the hydrate is formed, either on the sides of the tube, where the layer of water is very thin, or at the *free surface* of the liquid, *i.e.*, where the decrease in temperature has taken place. It was impossible to convert a large volume of water into the hydrate, since it froze before the whole of it was saturated. It was therefore necessary to take a small drop of water and expose it over a large surface. For the formation of $\text{C O}_2 + \text{H}_2 \text{ O}$, $S=1236$, the pressure corresponding with this solubility (admitting the possibility of obtaining such a pressure) could only be obtained at a temperature so low that the probability is greatly in favour of the water freezing before it is reached.

A New Volumetric Process for the Estimation of Sulphuric Acid.

A. Guyard. (*Moniteur Scientifique*, August, 1882.) 25 c.c. of titrated normal solution of lead nitrate are placed in a beaker and coloured bright yellow by means of a few drops of solution of potassium iodide. The sulphuric acid solution is then added from a burette until the yellow colour of the mixture is discharged, and the strength calculated from the volume thus required.

The process is applicable for the determination of either free or combined sulphuric acid, but other acids or salts forming precipitates with lead nitrate must be known to be absent.

Determination of Boracic Acid. E. F. Smith. (*Amer. Journ. of Pharm.*, January, 1883.) When a solution of manganese sulphate is added to one of borax, and to this mixture an equal volume of alcohol, there separates rapidly a white flocculent precipitate of manganese borate, $\text{Mn B}_4 \text{ O}_7$, insoluble in alcoholic liquids. The

excess of manganese sulphate remains in solution, and can readily be determined in the filtrate from the borate after the evaporation of the alcohol. To ascertain whether the above might be available quantitatively, the following solutions of definite strength were prepared, and the experiments recorded:—

1. A solution of manganese sulphate, made by dissolving 3 grams of anhydrous MnSO_4 in 250 c.c. H_2O . 10 c.c. of this solution correspond to .0600 gram MnSO_4 .

2. Potassium permanganate solution of such strength that 18.5 c.c. were equivalent to 10 c.c. of solution No. 1.

3. Borax solution: 10 grams well-crystallized borax dissolved in 1 litre of H_2O .

The manner of conducting each experiment was as follows: To 10 c.c. of the borax solution were added 10 c.c. MnSO_4 solution, and an equal volume of strong alcohol. The whole was well mixed, allowed to stand, carefully covered for half an hour, when the manganese borate was filtered rapidly (best with a suction pump), and washed well with alcohol. The filtrate and washings were placed in a platinum or porcelain dish, and evaporated to dryness on a water-bath. The residual manganese was then determined according to Volhard's method, by dissolving it in water, adding zinc sulphate, then heating almost to the boiling point, and carefully running in potassium permanganate until the liquid assumed a pink colour. The quantity of manganese sulphate thus found and deducted from the whole amount of the salt added, gave a difference representing the manganese sulphate which had combined with the borax.

The results quoted by the author are very satisfactory, and prove that the method can be successfully applied in the analysis of soluble borates.

In estimating the boracic acid in insoluble borates, as tourmaline, the following course was pursued. The finely pulverized substance was fused with a weighed quantity of pure sodium carbonate, the fused mass exhausted with water, and to the filtrate containing all the sodium borate, together with some sodium silicate and aluminate, was added an amount of pure ammonium sulphate molecularly equivalent to the sodium carbonate. The solution was then digested until all the ammonia was expelled, and the volume of the liquid largely reduced. Any silicic acid or aluminium hydrate which had separated was now filtered off, and the precipitate thoroughly washed with hot water. The solution, again reduced in volume, and containing only the borate and sulphate of

sodium and excess of ammonium sulphate, was mixed with a definite amount of a manganese sulphate solution (strength previously determined), alcohol added, and after standing one half hour the borate was removed by filtration, the filtrate evaporated to dryness, and the residue carefully ignited to expel the ammonium salt. The manganese sulphate left was dissolved in water, and the same procedure followed as in the preceding experiments described.

Volumetric Estimation of Sulphocyanides. (*Moniteur Scientifique*, March, 1883.) For the volumetric analyses of these salts an average sample of 3 to 5 grams is dissolved in water, diluted to 500 c.c., and filtered if needful. The solution is poured into a burette with a ground-glass tap. 10 c.c. of a decinormal solution of silver nitrate are measured off into a porcelain capsule, along with 1 to 2 c.c. of a solution of iron nitrate, and the sulphocyanide is allowed to flow into this mixture until a permanent red colour is obtained. This colour does not obtain as long as any silver remains in solution. Each c.c. of the silver solution represents 0.00580 gram sulphocyanogen, or, 0.00590 hydro-sulphocyanic acid. To prepare the ferric nitrate above mentioned, 2 to 5 grams of pianoforte wire are dissolved in nitric acid, evaporated in the water-bath to expel excess of acid, and made up to 100 c.c. with distilled water.

The United States Pharmacopœia Process for Estimating the Strength of Hydrocyanic Acid. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xiii. 917.) The author points out a serious error in some of the statements of the U. S. Pharmacopœia. Chromate of potassium, instead of indicating the volume of silver nitrate solution required for the complete formation of double cyanide of silver and magnesium, really indicates twice that volume of the test solution; a quantity sufficient, not merely for the complete formation of the soluble double salt named, but also for the subsequent precipitation of the whole of the cyanogen in the form of silver cyanide. 100 c.c. of the decinormal silver solution should therefore be required instead of the 50 stated in the process; or, in other words, 1 c.c. of the solution is equivalent to .0027 instead of .0054 gram of anhydrous H Cy.

Process for the Recognition of Hydrocyanic, Hydrochloric, Hydrobromic, Hydriodic, Chloric, Bromic, Iodic, Hydro-ferrocyanic, and Hydro-ferricyanic Acids. A. Longi. (*Chemical News*, xlvii. 209.) The substance under examination is dissolved in water, and the solution acidulated with acetic acid. If insoluble in water, it is heated to a boil with sodium carbonate, and the filtrate is acidified

with acetic acid. After any sulphuretted hydrogen present is expelled, silver nitrate is added in slight excess, and a little nitric acid. The precipitate may contain silver cyanide, chloride, bromide, iodide, bromate, iodate, ferrocyanide, and ferricyanide. In the solution may be present silver chlorate, bromate (in part), and mercuric cyanide. The liquid (*a*) is separated from the precipitate (*b*), and examined separately.

(*a*) In the liquid hydrogen is liberated by means of zinc and a little sulphuric acid. Silver chlorate and bromate are reduced to the corresponding chloride and bromide, and both these, along with mercuric cyanide, to metallic silver and mercury, hydrocyanic, hydrochloric, and hydrobromic acids being formed. When the reaction is at an end, the mixture is filtered, and the filtrate is divided into three parts.

The first part is tested for cyanogen with a ferric-ferrous salt.

To the second part is added silver nitrate, which separates hydrocyanic, hydrochloric, and hydrobromic acids. The precipitate is washed and digested in ammonia of sp. gr. 0.998. If the liquid filtered from the precipitate gives with nitric acid a white precipitate, insoluble in concentrated boiling nitric acid, chloric acid was present.

The third portion is tested for bromine with carbon bisulphide. The presence of bromine shows that the original substance contained bromic acid.

(*b*) The precipitate is carefully washed, and then digested in ammonia of sp. gr. 0.998. The cyanide, chloride, bromate, iodate, and ferricyanide are dissolved, but not the bromide, iodide, and ferrocyanide.

The residue is washed and treated with a solution of sulphuretted hydrogen, to which a little hydrochloric acid has been added. It is heated to expel excess of sulphuretted hydrogen, and filtered.

The filtrate is tested for hydro-ferrocyanic acid, with a ferric-ferrous salt. Any ferrocyanide formed is filtered off, and the filtrate is tested for bromine and iodine with carbon bisulphide.

The ammoniacal solution, which may contain cyanide, chloride, bromate, iodate, and ferricyanide, is treated with sulphurous anhydride. Cyanide and chloride are separated out; bromate, iodate, and ferricyanide are reduced to bromide, iodide, and ferrocyanide, and thrown down as such. The precipitate is washed by decantation, and digested in ammonia. The cyanide and chloride are redissolved, but not the bromide, iodide, and ferrocyanide. The mixture is filtered. The solid matter is tested for bromine, iodine,

and hydro-ferrocyanic acid, as above directed. Their presence shows that the original substance contained bromic and iodic acids and hydro-ferriecyanic acid.

To the liquid is added nitric acid, by which cyanide and chloride are re-precipitated. The precipitate is divided into two parts. The one is treated with a little dilute hydrochloric acid, and filtered. The filtrate is tested for hydrocyanic acid with a ferric-ferrous salt. The other portion is heated to a boil with concentrated nitric acid. Cyanide is thus converted into nitrate, whilst chloride remains unchanged.

Method for Determining Hydrochloric, Hydrobromic, and Hydriodic Acids in Solutions containing Sulphuretted Hydrogen. H. Topsøe. (*Ibid.*, 216.) If a solution of sulphuretted hydrogen is gradually mixed with a moderately strong solution of potassium permanganate, previously acidified with a sufficiency of nitric acid, the liquid remains at first quite clear; a relatively small quantity of sulphur then separates out in the free state, and not until all the sulphuretted hydrogen is oxidized does the crimson colour of the permanganate appear. It vanishes again quickly, whilst brown manganese peroxide is deposited. The sulphuretted hydrogen, by the gradual addition of the oxidizing agent, is converted into sulphuric acid, a comparatively small quantity of sulphur, and into traces of one of the lower oxides of sulphur, probably the hypo-sulphurous.

If, on the other hand, the solution of permanganate is added quickly, with stirring, and in such quantity that the liquid after the settlement of the hydrated peroxide retains a crimson colour, the sulphuretted hydrogen is completely oxidized to sulphuric acid. The result is unchanged if the solution of sulphuretted hydrogen contains hydrochloric acid or a metallic chloride, and what has already been said is in this case still applicable. If hydrobromic acid or a metallic bromide exists in the solution when the permanganate solution is continuously added, and the sulphuretted hydrogen entirely removed, the bromine is set at liberty. This completes the oxidation to sulphuric acid, even when not such a large excess of permanganate is present as is required if sulphuretted hydrogen is present alone or accompanied by a chloride. If hydriodic acid or a metallic iodide is present, the sulphuretted hydrogen is at once decomposed by the addition of the permanganate solution, which in this case must be used in a dilute state. Free sulphur is deposited, and the reaction is complete when the liquid assumes a slight yellowish brown colour from the iodine liberated.

After the sulphuretted hydrogen has been thus transformed or decomposed by the oxidation process, the liberated bromine or iodine may be converted into hydrogen compounds by means of aqueous sulphurous acid. In the same manner, or by means of oxalic acid, the manganese peroxide may be reduced to manganous compounds. A possible excess of sulphurous or oxalic acid is lastly removed by the cautious addition of a dilute solution of permanganate. The liquid contains then nothing which can interfere with the precipitation by silver nitrate.

The method thus indicated is applied as follows in the several cases:—Chlorine is determined in a liquid in which the existing sulphuretted hydrogen is, if possible, completely oxidized by the instantaneous addition of a large excess of permanganate, and thus converted into sulphuric acid. For every 100 c.c. of a solution of sulphuretted hydrogen, saturated at common temperatures, at least 3.25 grams potassium permanganate must be added, along with at least 4 grams of nitric acid. But the chemist usually has to do with a liquid from which a metallic sulphide has been precipitated by sulphuretted hydrogen, the precipitate has been filtered off, and washed. The liquid must therefore have lost a large proportion of the sulphuretted hydrogen with which it had been saturated. Hence the real consumption of permanganate is far smaller. The author finds by direct experiment that unless sulphuretted hydrogen water has been used for washing the precipitated sulphide, the oxidation can be completely effected by the application of 1.5 gram of permanganate per 100 c.c. of the original sulphuretted solution. But if the washing has been effected with sulphuretted hydrogen water, the permanganate solution is added rapidly, with constant stirring, until the liquid becomes so deeply crimson as to be opaque.

After a sufficiency of permanganate has been added (preferably dissolved in 20 to 25 parts by weight of water, with 3 to 4 parts of strong nitric acid), the liquid is allowed to stand for a few minutes, and a solution of oxalic acid is gradually added, stirring constantly. After the greater part of the sediment has been dissolved, the acid is added only drop by drop, until the liquid is completely clear. To remove an excess of oxalic acid (which is not easily avoided on account of the slowness with which it acts at common temperatures upon the manganese peroxide), the liquid is heated to 35°, and a dilute solution of permanganate is added, until the liquid takes a faint pink tint. A single drop of oxalic acid solution removes this slight excess of permanganate.

An aqueous solution of sulphurous acid may also be used as

reducing agent instead of oxalic acid, taking the same precautions to avoid and remove excess. In this case the proportion of sulphuric acid in the liquid will naturally be greater than when oxalic acid has been used.

If the sulphur has been thus completely oxidized to sulphuric acid, the precipitation with silver nitrate can be at once undertaken after the treatment with oxalic acid or with sulphurous acid. If a small proportion of sulphur has been deposited, it must be removed by filtration.

For the determination of bromine the liquid in question is quickly mixed with a strong solution of permanganate (1 part in 20–25 parts of water, with 3–4 parts strong nitric acid), stirring continually, until the liquid smells of bromine. The oxidation is then complete, and the liquid, after treatment with sulphurous acid, can be directly precipitated with silver nitrate. The sulphurous acid is cautiously added till the sediment of manganese peroxide is redissolved, removing excess in the manner already laid down under chlorine.

For the determination of iodine a dilute solution of permanganate (1 part to 50 of water, and 1.5–2 of nitric acid) is added until the liquid takes a faint brownish yellow colour from the liberation of iodine. No manganese peroxide is precipitated. The sulphur is entirely deposited in the free state, and is removed by filtration after the liquid has been decolorized by means of a few drops of aqueous sulphuric acid. The iodine is then precipitated with silver nitrate in the ordinary manner.

Method for Determining Hydrochloric, Hydrocyanic, Hydroferrocyanic, and Sulphocyanic Acids when simultaneously present. W. Borchers. (*Ibid.*, 218.) If hydrochloric, hydrocyanic, and hydro-sulphocyanic acids are present, 10–20 grams of the saline mixture are present, and the solution is diluted to a litre. In one portion of this liquid the total quantity of the three acids is ascertained by titration with silver solution. To another portion is added the exact quantity of the silver solution thus ascertained, and the precipitate is quickly filtered off. Washing is only required if the filtrate contains sulphates. The precipitate is not dried, but the funnel with its contents is placed on a glass flask, and the precipitate washed down with nitric acid of 1.37–1.40 sp. gr. The contents of the flask are heated to a boil, and kept at this temperature till no more red fumes escape, adding more nitric acid if needed.

The undissolved portion of the precipitate contains all the chlorine

in the form of silver chloride, which is separated by filtration. The filtrate contains silver sulphate equivalent to the sulphocyanide, and silver nitrate representing the cyanide. The sulphuric acid and the dissolved silver are therefore determined. The author finds it advisable to precipitate the sulphuric acid with barium nitrate, and to titrate the silver in the diluted filtrate partially neutralized with alkali.

The chlorine is found from the weight of the silver chloride, the sulpho-cyanogen from the sulphuric acid, and the cyanogen from the difference. The quantity of silver required to combine with the sulpho-cyanogen and cyanogen is found also by two other ways—by subtracting the quantity of silver calculated from the weighed precipitate of silver chloride from that necessary for precipitating all the acids, and, on the other hand, by direct titration of the silver dissolved by nitric acid.

If hydro-ferrocyanic acid is present along with the three others, the totality of the four acids is determined in one portion by titration with silver solution. If this is done by Volhard's method, the ferric solution used as indicator must not be added till after complete precipitation with silver solution, as otherwise a deposit of Prussian blue would take place. In a second portion the ferrocyanide is precipitated with an acid ferric salt free from chloride, the precipitate is filtered off, and the three other acids are determined as above.

Direct Estimation of Chlorine in Presence of Bromine and Iodine. G. Vortmann. (*Monatsh. Chem.*, iii. 510-530. From *Journ. Chem. Soc.*) Two years ago the author published a short notice on the detection of chlorine in presence of bromine and iodine, depending on the reactions of chlorides, bromides, and iodides, with the peroxides of lead and manganese, in presence of acetic acid of various degrees of dilution; and more recently he has given a sketch of the application of these reactions to quantitative analysis. In the present paper, the reactions concerned in these processes are more fully discussed, and the methods of estimation are described in detail, and illustrated by numerous examples.

Estimation of Chlorine in Presence of Bromine.—When the quantity of bromine present is but small, it is sufficient to heat the mixture of chloride and bromide with lead dioxide and acetic acid of 2-3 per cent. two or three times on the water-bath. With larger quantities of bromine, complete separation is somewhat difficult; the method of effecting it will be further considered in connection with the separation of chlorine from bromine and iodine together.

Estimation of Chlorine in Presence of Iodine.—This is effected in the same manner as in the last case, lead dioxide being used when the quantity of iodide present is but small, manganese dioxide being preferable when it is large. In this case, also, the evaporation with dilute acetic acid must be repeated several times. The expulsion of the iodine may be accelerated by first boiling the liquid for a few minutes in a small flask; this, however, can be done only when lead dioxide is employed, as the use of manganese dioxide quickly gives rise to violent percussive ebullition. In the latter case the liquid must be heated in a beaker on the water-bath, while a stream of air is passed through it. The estimations come out sharp, even when large quantities of iodine are present. In using lead dioxide when small quantities of chlorine are to be estimated in presence of much iodine, the results are apt to come out too high.

Estimation of Bromine in Presence of Iodine.—This estimation is very easily performed by evaporating down the mixture of bromide and iodide with manganese dioxide and dilute acetic acid several times on the water-bath, the evaporation being accelerated, if desired, by passing a stream of air through the liquid.

Estimation of Chlorine in Presence of Bromine and Iodine together.—This may be effected either by boiling with lead dioxide and dilute acetic acid, whereby the iodides and bromides are decomposed simultaneously; or by first expelling the iodine by evaporating down with manganese dioxide and acetic acid, and then the bromine by repeating this operation after addition of lead dioxide. In operating by the first method, the mutual action of iodine and bromine gives rise to the formation of iodic acid, to prevent which, as far as possible, it is advisable to add the lead oxide to the boiling solution by small portions at a time. The liquid having been boiled for about half a hour, and the water as it evaporates renewed from time to time, the dissolved lead is precipitated by hydrogen sulphide, without previous filtration; and the liquid, after being once more treated with hydrogen sulphide, is warmed for some time on the water-bath, and filtered. The filtrate is then evaporated to complete dryness on the water-bath, the residue drenched with dilute acetic acid, and the liquid evaporated down after addition of a small quantity of lead dioxide. The evaporation to dryness is then once more repeated, the residue finally dissolved in water, and the chlorine precipitated from the filtrate by nitrate of silver. In working by the second of the methods above mentioned, the mixture of the halogen compounds is several times evaporated down on the water-bath with lead dioxide and acetic acid, and the chlorine in the resi-

due is estimated in the usual way. This method is preferable to the former, in so far as it affects the expulsion of all the iodine and bromine without formation of oxy-acids, and may also afford the means of estimating these two halogens at the same time. Moreover, it gives more exact results than the first method; but, on the other hand, it has the disadvantage that in decomposing the iodides by manganese dioxide, manganese passes into solution and is precipitated in the subsequent treatment with lead dioxide, in the form of manganese dioxide, or rather of a compound of this oxide with dioxide of lead, $MnO_2, 4 PbO_2$: this precipitate is difficult to wash, and it is only after prolonged treatment with boiling water that filtrates are obtained which no longer become opalescent on addition of silver nitrate.

The numerous analyses given in the paper show that the method therein described is applicable in all cases to the separation of chlorine from bromine and from iodine. Moreover, it gives satisfactory results in the estimation of relatively large quantities of chlorine in presence of small quantities of bromine. When, on the other hand, much bromine is present, the results, even with careful working, come out too high by several units per cent.

Finally, the author observes that it is not necessary to bring the chlorine into combination with an alkali-metal by decomposing the lead chloride obtained in the process with potassium sulphate, inasmuch as the entire process is performed with hot dilute solutions, and the solubility of the lead chloride is very considerably increased by the presence of the dilute acetic acid and solution of lead acetate; so that an incomplete solution of the lead salt is not to be apprehended. The manganese dioxide and lead dioxide added in excess are very easy to wash, and the filtrates after a short time give not the slightest turbidity with silver nitrate.

The bromine or iodine given off in these processes of separating chlorides from bromides and iodides may be collected and estimated. With regard to the estimation of iodine in presence of chlorine or bromine, the author has already obtained satisfactory results. For bromine, the numbers hitherto obtained are less satisfactory; but he hopes soon to arrive at more exact results, which may form the subject of a further communication.

A Modified Process for the Estimation of Chlorine in Bleaching-Powder. J. W. C. Harvey. (*Chemical News*, xlvii. 51.) The original process is that in which the chlorine in bleaching-powder is determined from the number of c.c. of a bleaching solution of known strength required to convert a solution of ferrous chloride

containing a weighed quantity of pure iron into ferric salt. The modification proposed does away with the weighing of the iron and the making of ferrous chloride from it. The basis of the method consists in adding a measured quantity of a dilute solution of stannous chloride to excess of a solution of ferric chloride, the amount of ferrous salt thus formed being determined by standard potassium dichromate; by this means, therefore, a known quantity of ferrous chloride can be formed immediately. The estimation is thus worked: the same quantity of stannous chloride as in the test experiment is added to excess of ferric chloride; and the diluted solution is titrated with the bleaching-powder solution until all the ferrous iron is converted into ferric chloride. The amount of chlorine is calculated from the ferrous iron found by the dichromate, etc., etc. The required solutions are:—(1) Stannous chloride, dissolve 60 grams in hydrochloric acid, and make up to 1 litre: 5 c.c. of this solution suffice for an experiment. The amount of ferrous chloride to which it corresponds should be determined before each series of estimations. (2) Ferric chloride, which must be free from ferrous salt. (3) Standard dichromate, 30 grams in 2 litres.

Volumetric Estimation of Manganese Dioxide. J. W. C. Harvey. (*Chem. News*, 1883, 2.) The requisite solutions are:—(1) Standard potassium dichromate, 30 grams of pure salt in 2 litres; so that 1 c.c. = $0.017 \text{ Fe} = 0.013205 \text{ Mn O}_2$. (2) Stannous chloride solution: dissolve 180 grams in hot hydrochloric acid, and when clear make up to 1 litre with water. (3) Ferric chloride solution containing 60 grams of iron per litre. To work the process, 1 gram of the finely powdered manganese dioxide is warmed with 10 c.c. of the stannous chloride solution and 15 c.c. hydrochloric acid, until the oxide is dissolved; excess of ferric chloride is now added, and the whole heated again; finally the amount of ferrous chloride formed by the residual stannous chloride is determined with potassium dichromate. This being done, 10 c.c. of stannous chloride solution are heated with excess of ferric chloride, and the amount of ferrous salt is determined with the dichromate. From the difference between this and the former determination, the manganese can be calculated. An analysis occupies fifteen minutes. The stannous chloride should be tested against the dichromate if any length of time elapses between the determinations. The method has been tested against Fresenius and Will's process, and has always yielded better results.

Note on Reinsch's Test. J. Macallan. (*Analyst*, 1883, 46.) In testing for arsenic by Reinsch's method there is a serious source

of error which seems to have been overlooked, viz., the deposition of free sulphur, together with cupric sulphide, on the copper, and its sublimation when heated. In examining decomposing organic substances, sulphur is frequently deposited owing to the decomposition of free sulphuretted hydrogen; so much so, sometimes, as to take fire and burn with a blue flame when a lighted taper is applied to the copper. When heated in a tube, the sulphur forms a sublimate having a general appearance and behaviour similar to that of arsenious oxide, being white in small quantity, and resubliming unaltered. It is mentioned in some works that sulphur cautiously sublimed condenses in rhombic octahedrons; but the author has not found it deposit in that form. Under the microscope it is seen to consist of globules. When, however, these are so small as to render their outlines indistinct, they resemble closely the crystals of arsenious oxide in transparency, lustre, and aggregation. When doubt exists, the safest course might be to procure as much of the sublimate as possible, boil down a second time with dilute acid and copper, and examine any sublimate obtained, microscopically, and with the usual confirmatory tests.

Methods of Detecting Lead, Silver, and Mercury in cases of Poisoning. V. Lehmann. (*Zeitschr. Physiol. Chem.*, vi. 1-42; *Journ. Chem. Soc.*, 1883, 687.) After fully discussing the literature of the subject, the author describes a series of quantitative experiments, in which the delicacy of various processes which have been employed for the detection of those metals is put to the test.

As regards lead, the sensitiveness of certain reagents were in the first place determined.

Hydrogen sulphide proved the most sensitive, giving a precipitate with lead nitrate in 10,000,000 of water in neutral or alkaline solution, and with 1 in 200,000 in acid solution.

Sulphuric acid, with the addition of alcohol, detected 1 in 50,000 of water, as also did potassium chromate; while potassium iodide sufficed only to indicate 1 part in 12,500 of water. Hydrogen sulphide in alkaline solutions is therefore the most delicate reagent for the detection of lead.

In the examination of the organs of the body and of organic fluids, such as urine, it is necessary first to destroy all organic matters by hydrochloric acid and potassium chlorate, otherwise the separation of lead takes place incompletely, or even not at all.

In the separation of lead in this way, electrolysis yielded results as favourable as those obtained with hydrogen sulphide. The method employed was to place the solutions freed from organic

matter and acidulated with hydrochloric acid in a bell-jar, closed below by means of parchment paper, and placed in very dilute sulphuric acid. The positive electrode from a battery of three small copper-zinc couples dipped into the solution lying on the parchment diaphragm, on the other side of which lies the negative electrode. Both electrodes were of platinum foil. After twenty-four hours the lead deposited upon the positive electrode was dissolved by boiling with dilute nitric acid, the solution evaporated to dryness, and the residue redissolved in water, with addition of caustic soda. It was then tested by hydrogen sulphide in the usual way. Other methods, which it is needless to specify, Mayençon and Bergeret's and Reinsch's, gave incomplete results.

For the quantitative determination of lead under these circumstances, Lehmann adopts the colorimetric method of G. Bischoff (*Zeitschr. Anal. Chem.*, 1879), using hydrogen sulphide in presence of alkali.

After the administration of salts of lead, the metal may be detected in the urine and all organs of the body; in the case of rabbits to which lead had been given in doses of 3-4 mgrms. daily, traces of it were found in the urine after the first day. The greater portion of the lead is deposited in the tissues, and after four or five days, while mere traces are discernible in the blood, large quantities are found in the heart, lungs, kidneys, brain, and bones.

For silver, hydrochloric acid is the most sensitive test. The reaction with hydrogen sulphide is precipitated in solutions containing 1 part of silver nitrate in 200,000 of water, and with potassium chromate only when 1 in 10,000. Hydrochloric acid, on the other hand, still gives a visible turbidity with 1 part in 400,000.

The separation of silver by hydrochloric acid from solutions containing salts and organic matters is not complete, as for instance from the urine which holds alkaline chlorides in solution, these latter dissolving in part silver chloride. In such cases, and in the organs of the body, organic matters must first be destroyed, not by means of potassium chlorate and hydrochloric acid, but by fusion with potassium nitrate and sodium hydrate. From the residue left after extracting the salts by water, the reduced silver is dissolved in nitric acid, filtered, evaporated, redissolved in water, and precipitated by hydrochloric acid.

Other methods of determining silver, such as separation on copper foil, zinc-dust, and electrolysis, give unsatisfactory results. By the above methods silver was detected in 60 c.c. of the urine of a rabbit, under the skin of which 18 mgrm. silver nitrate had been

injected. Similarly, after subcutaneous injection, in eight dogs, of 48 mgrm., silver was discovered in the urine and liver.

Mercury is found in cases of poisoning in all the tissues and secretions of the body. The author considers the methods of Schneider (*Sitzungsberichte der Kaiserlich. Akad. der Wissenschaft., Mathemat. Naturwissensch. Classe*, xl. Nr. 8, Wien, 1860), and of A. Mayer (*Wiener Med. Jahrbücher*, 1 Heft, 1877), as alone yielding accurate results. In Schneider's method, the substance under examination is freed from organic matters by means of potassium chlorate and hydrochloric acid, and the filtrate subjected to electrolysis, the mercury being best deposited on a gold electrode, which Lehmann found to give more sensitive results than copper.

The deposited mercury is converted into iodide, for which purpose the electrode is introduced into a glass tube drawn out in a capillary bore at one end, and sealed at the other. The latter part being heated, the resulting sublimate is driven into the capillary portion, which, with a bulb-shaped part of the wide tube is then cut off before the blowpipe. This latter part is opened, and some iodine being introduced, is again closed. The iodine vapour penetrates the capillary end, and changes the mercurial sublimate into iodide. According to Lehmann, the sensitiveness of the test is heightened if this reaction takes place in a slow current of air, while the gold electrode is cautiously heated, and the mercury volatilised in presence of the iodine. In this way 0.1 mgrm. Hg Cl_2 , may be detected in 100 c.c. of urine. Mayer's method, by which the mercury is distilled in presence of steam is even more sensitive. Urine, or the finely divided organ, diluted with water, is mixed with slaked lime, and solution of potash in a flask having a capacity of about thrice the volume introduced. A U tube filled with glass wool moistened with silver nitrate is connected with the flask, and both are heated in a calcium chloride bath to 130–140°. The glass wool is afterwards inserted in a tube and converted into iodide, as already described. A 2 per cent. solution of sodium chloride may advantageously replace the water used in this method, frothing being avoided, and the mercury more rapidly volatilised.

By this method 0.1 mgrm. Hg Cl_2 may be detected in 1 litre of urine. For details of both processes, the reader is referred to the original memoir.

After subcutaneous injection of mercuric chloride to the amount of 3–4 mgrms. daily for five days in a rabbit, mercury was found in greatest amount in the heart, lungs, liver, and muscles, least in the brain, bones, and urine.

Estimation of Arsenic in Copper. A. H. Sexton. (*Chemical News*, xlv. 255.) After repeated experiments, the following method was devised :—The copper is dissolved in nitric acid, a small quantity of solution of ferric nitrate added, the solution nearly neutralized with soda, and excess of sodium acetate added. It is then heated to boiling, and filtered as rapidly as possible; the precipitate, after being well washed, is dissolved in hydrochloric acid, the solution made alkaline with ammonia, saturated with sulphuretted hydrogen, and filtered from the precipitated iron sulphide. The filtrate is acidified with hydrochloric acid and allowed to remain in a warm place for some time. The arsenic and antimony sulphides are filtered off, and dried at 100° ; and the precipitates, after complete removal from the paper into a small beaker, are treated with fuming nitric acid, a few drops of hydrochloric acid being added as soon as the action has ceased. The liquid is then diluted and filtered, and the arsenic is precipitated as ammonio-magnesium arsenate, and weighed as usual. If the precipitated sulphides cannot be perfectly removed from the filter-paper, the latter must be treated with nitrohydrochloric acid, filtered, and the filtrate added to the nitric acid solution. This method has been found to give accurate results, and each stage of the process has been carefully investigated. It requires, however, some special precautions. When the sodium acetate is added, the colour should change from pale blue to dark green, this shows that the solution has been sufficiently neutralized. If the solution be now left boiling (sometimes when it is not), a greenish white precipitate of basic copper acetate falls. This can generally be removed by adding a few drops of hydrochloric acid; but in cases where it has separated on the surface, or where it will not readily dissolve, it is best to throw away the solution and begin again. The precipitate should have the dark red colour of ferric acetate; if it is paler, it is due either to there not being sufficient iron, or to the co-precipitation of some basic copper acetate. The filtrate should be blue or pale green; sometimes it is dark green and turbid, from the presence of iron acetate carried through the filter; in that case the first portions must be passed through the filter. The precipitate must be washed until it is free from copper. If on dissolving it in hydrochloric acid the solution is at all green, it must be neutralized, a little more sodium acetate added, and the iron and arsenic reprecipitated. It was found that with 1.5 parts of iron to 1 of arsenic the precipitation was complete. In order to make sure, it is well to add about twice as much iron as is expected there is arsenic present. Then, if a little iron remains

unprecipitated, all the arsenic will be thrown down. Since copper sulphide retains so much arsenic, it might be expected that iron sulphide would act in a similar manner; but it does not. If there be no copper present, the precipitate is quite free from arsenic; but if copper is present, a considerable quantity of arsenic may be retained. Hence the importance of thoroughly washing the acetate precipitate, and reprecipitating if necessary. The antimony will be in the filtrate from the ammonio-magnesium precipitate, and may be estimated by Abel and Field's method, fuming nitric acid being preferable as the oxidizing agent. The arsenic may also be readily estimated by precipitating with ammonium molybdate, redissolving in ammonia, and precipitating as ammonio-magnesium arsenate; but in this method the antimony must be estimated in a separate portion.

Determination of Impurities in Metallic Copper. Dr. R. Fresenius. (*Zeitschr. für Analyt. Chem.*, xxi. 229-234; and *Journ. Chem. Soc.*, 1882, 1232.) 100 grams of the sample are treated with pure nitric acid of 1.2 sp. gr. The filtrate is collected in a tared flask graduated to hold 2,000 c.c. The residue insoluble in nitric acid is fused with sodium sulphide and sodium carbonate, and the melted mass lixiviated with water. The black residue which remains is oxidized with nitric acid, and from the solution the *silver* is precipitated with hydrochloric acid, the *lead* with sulphuric acid, and from the filtrate *bismuth* by sulphuretted hydrogen. The sulphide solution, containing *antimony*, *tin*, and *arsenic*, is precipitated with hydrochloric acid, and the precipitate, consisting of sulphides and free sulphur, is treated with a hydrochloric bromine solution. From this solution the metals are again precipitated as sulphides, dissolved in ammonium sulphide, the solution is evaporated in a porcelain crucible, and the residue fused with sodium hydroxide and nitrate. The antimony is weighed as sodium antimonate, tin and arsenic being separated according to H. Rose's method.

To 1 litre of the copper solution, corresponding with 50 grams of the sample, four drops of hydrochloric acid are added. Any chloride of silver is allowed to settle, and the *silver* determined as metal, the amount being added to that found in the nitric acid residue. To the filtrate from the silver chloride, 85 grams pure sulphuric acid previously diluted with water are added, and the solution is evaporated to remove all nitric acid. The residue is treated with water until all cupric sulphate has gone into solution, and filtered from the insoluble *lead* sulphate, which is weighed as such. It should be entirely soluble in ammonium acetate. The

filtrate from the lead is made up to two litres, and divided into four equal portions, each portion being then diluted with about an equal bulk of water, acidified with 50 c.c. hydrochloric acid of 1.12 sp. gr., and precipitated with sulphuretted hydrogen at 70° C. The contents of the four flasks are then washed into a weighed stoppered flask holding about six litres, and the whole is again weighed. After allowing the precipitate to settle, the fluid is drawn off as completely as possible, the remaining quantity being weighed to ascertain the weight of the drawn-off solution. The latter is evaporated in a porcelain basin, and the residue heated until most of the free sulphuric acid has been driven away. It is then heated with a little nitric acid, and the *iron* is precipitated with ammonia, the oxide being redissolved and again precipitated. In the filtrate from the iron precipitate, *nickel*, *cobalt*, and *zinc* are determined as usual.

Soda is added to the precipitated sulphide in the weighed flask until the solution is alkaline, then sodium disulphide, and the whole is gently heated. It is then diluted with much water, the precipitate allowed to settle, and from the weighed total the clear fluid is drawn off and also weighed; the sulphides of *tin*, *arsenic*, and *antimony* are again precipitated from it by hydrochloric acid and separated as described, the amounts found being added to the portions already estimated.

The principal sulphide precipitate (containing the copper) is washed with dilute sodium sulphide solution, dissolved in nitrohydrochloric acid, and the solution evaporated with an excess of hydrochloric acid; the saline residue is then treated with water, the *bismuth* remaining undissolved mixed with some copper: this is dissolved in hydrochloric acid, alkali is added until the reaction is alkaline, and cyanide of potassium in excess. The bismuth can then be precipitated from the solution as sulphide, free from copper.

400 c.c. of the original nitric acid solution (corresponding to 20 grams of copper) are nearly neutralized with ammonia, and a few drops of barium nitrate are added. If the copper contain any *sulphur* (present according to Hampe in the form of sulphurous acid) a precipitate of barium sulphate is obtained, which is weighed; but as barium sulphate is slightly soluble in copper nitrate solution, it is necessary to treat the copper in a current of chlorine in order to detect very small traces of sulphur.

Another quantity of 400 c.c. of the original solution is repeatedly evaporated with hydrochloric acid, the residue is dissolved in about 1200 c.c. of water, and the solution is precipitated with sulphuretted

hydrogen; the *phosphoric acid* in the filtrate is precipitated with molybdic solution as usual.

Separation of Cadmium and Copper. A. Orlowski. (*Zeitschr. für Analyt. Chem.*, xxi. 214.) The blue ammoniacal liquid containing copper and cadmium, obtained in the usual course of analysis after precipitation of the bismuth by ammonium hydrate, is acidified with hydrochloric acid, then decolorized by means of stannous chloride, and afterwards boiled with milk of sulphur. The copper is thus completely precipitated as sulphide; and the filtrate, after being freed from tin by an excess of ammonia, may be tested for cadmium with sulphuretted hydrogen.

Volumetric Determination of Lead. M. Buisson. (*Chemical News*, xlv. 48.) The author's method is based on the precipitation of lead by potassium bichromate in excess; the excess of the bichromate employed is found by decomposing it in the cold by potassium iodide in presence of sulphuric acid. The reaction is almost instantaneous at common temperatures, and is complete in two or three minutes. The iodine set at liberty is determined with sodium hyposulphite as indicator, either the disappearance of the blue tint of the iodide of starch or the decoloration of iodine in carbon disulphide may be made use of. The author prefers the latter, as being much the more sensitive, for the liquid being always tinged greenish by the salt of chromium produced, the sensibility of the reaction of starch is much lessened. The standard solution of bichromate is prepared by dissolving in distilled water 14.248 grams pure fused potassium bichromate, and making the solution up to 1 litre: 5 c.c. precipitate exactly 0.1 gram lead. The relation between the standard liquids of bichromate and hyposulphite is thus determined. With a pipette 25 c.c. of the bichromate liquid are taken and diluted with water to 250 c.c. Of this new solution 50 c.c. are taken and put into a stoppered bottle capable of holding 250 to 300 c.c. The liquid is then acidulated with sulphuric acid (free from chlorine and nitrous vapours), and about 0.5 gram potassium iodide is added. The solution of hyposulphite is then added by means of a burette, graduated in one-tenths of a c.c., until the rose colour of the carbon disulphide disappears; the quantity of hyposulphite added corresponds to 5 c.c. of bichromate, or 0.1 gram of lead. The solution of hyposulphite is sufficiently strong, if from 35 to 40 c.c. are required, to decolorize the iodine set at liberty by 5 c.c. of bichromate. The sulphuric acid should not be added in too large excess, as it might decompose the hyposulphite before the latter can act upon the iodine.

In order to verify the standard of the bichromate, 0.3 gram of pure lead is dissolved in pure, hot nitric acid, for which purpose there are required about 20 drops of acid in 5 c.c. of water. When the lead is dissolved the liquid is heated to a boil, to expel nitrous vapours, and the excess of acid is saturated with potash until a permanent precipitate is obtained, which is then re-dissolved by a few drops of acetic acid. The solution of lead is poured into a graduated flask of 250 c.c. with 25 c.c. of the bichromate solution, and distilled water enough to make up the 250 c.c. After standing for fifteen minutes, the liquid is poured upon a dry filter, and the operation is completed in the same manner as if the bichromate alone were present, as described above. The difference between the quantities of hyposulphite employed for decomposing the bichromate before and after partial precipitation by lead represents the bichromate in c.c. of hyposulphite, and consequently the lead which has been precipitated. For the assay of lead ores, the sample is ground in an agate mortar, and from 0.5 to 1 gram or more, is weighed out, according to its richness. The weighed portion is dissolved in a few c.c. of boiling hydrochloric acid, and a little potassium chlorate is then added to peroxidize the iron, and the whole is boiled for a few minutes to expel chlorine. The liquid is then saturated with an excess of caustic potash, and the precipitate is re-dissolved in a few drops of acetic acid. It is then boiled again to precipitate the iron and aid the solution of the lead sulphate if any has been produced. The solution is filtered, and the precipitate is washed in boiling water. To the cold liquid there are added 25 c.c. of bichromate and water, so as to make up 250 c.c. After settling for fifteen minutes, the liquid is poured upon a dry filter. 50 c.c. of the filtrate are taken and treated as described above.

Titration of Iron with Sodium Hyposulphite. A. C. Oudemans, jun., and A. E. Haswell. (*Zeitschr. für Analyt. Chem.*, and *Chemical News*, xlvii. 210.) Oudemans proposes to determine iron in the acid solution of the chloride, to which a little solution of copper sulphate and potassium sulphocyanide has been added, by dropping in a solution of sodium hyposulphite of known strength until the red colour of the iron sulphocyanide has disappeared, and determining the excess of hyposulphite by titrating back with iodine solution.

A. E. Haswell modifies this method so as to avoid the possibly disturbing separation of copper sulphocyanide, and to dispense with the back titration with iodine. According to his experiments, the iodine-starch reaction often takes place too early, before all the

hyposulphite has been converted into sodium tetrathionate. He explains this occurrence by the tendency of copper iodide to split up into cuprous iodide and free iodine, and thus produce a premature blue coloration, which after a time disappears again as the cuprous iodide re-combines with the free iodine to form the cupric iodide.

Haswell mixes the moderately acid solution of ferric chloride, in presence of a cupric salt, with a few drops of a dilute solution of sodium salicylate, and then reduces with sodium hyposulphite. The deep violet colour of the solution fades gradually and becomes colourless in presence of a very slight excess of the reducing agent. The excess of sodium hyposulphite is then oxidized with a dilute solution of sodium dichromate. The limit of the reduction is sharply marked by the faint violet colour which indicates the oxidation of a trace of the iron. It must be remembered that strong hydrochloric acid destroys the colour produced by salicylic acid in ferric chloride, which, however, is restored on moderate dilution with water.

For the execution of the method there are required: a solution of sodium hyposulphite, standardized by means of a solution of ferric chloride of known strength; a solution of potassium dichromate, about half the strength of the sodium hyposulphite; a solution of copper, prepared by dissolving 2 grams cupric-ammonium chloride in 100 c.c. water; and a solution of sodium salicylate, containing about 5 grams of the salt per litre.

Five or ten c.c. of the iron solution are measured into a small flask, slightly acidulated with hydrochloric acid, and mixed with 1 to 2 c.c. of the copper solution and a few drops of the sodium salicylate. If the colour resulting is not a pure violet, but of an olive-brown, the liquid is diluted with water, and the hyposulphite is added until the liquid appears perfectly colourless on standing with the back to the window and looking through the flask at a sheet of white paper. It often happens that on adding more sodium salicylate a faint coloration reappears; but it is removed by a drop of hyposulphite. It is then titrated back with the dichromate until a faint violet coloration appears.

Separation of Barium from Strontium and Calcium by means of Potassium Chromate in Acetic Acid Solutions. J. Meschezerski. (*Zeitschr. für Analyt. Chem.*, 1882, 399.) The author has critically examined this method of separation, and arrives at the conclusion that, though applicable in qualitative analysis, is not suited for exact quantitative work.

Separation and Determination of Strontium and Calcium. D. Sidersky. (*Zeitschr. für Analyt. Chem.*, 1883, Part I.) The author's method is carried out as follows:—A few grams of the sample in question (*e.g.*, finely-ground strontianite) are dissolved in a spacious beaker in a minimum of hydrochloric acid, and boiled for a time; all the strontia, including that combined with silicic acid, is dissolved, whilst gelatinous silica is deposited. Ammonia in excess is next added, which precipitates oxide of iron and alumina, and the residue of the silica. This deposit is collected on a filter, washed with a minimum of water, dried, etc., and accounted for as "marl." The separate determination of its ingredients is of no practical importance. The filtrate must be concentrated on the water-bath, and mixed whilst warm with a mixture of ammonium oxalate and sulphate (prepared by dissolving 200 grams of sulphate and 30 of oxalate in 1 litre of water), which throws down strontium sulphate and calcium oxalate. A large excess of the reagent is to be avoided. The precipitate is carefully brought upon a filter, washed first with warm water, and then with dilute hydrochloric acid, which dissolves calcium oxalate, leaving strontium sulphate behind. The latter is then washed to remove the acid, dried, ignited, and weighed. The filtrate is mixed with ammonium oxalate in excess, whereby the calcium oxalate is re-precipitated. It is then washed, dried, converted into caustic lime by ignition over the blast-lamp, and weighed.

Determination of Caustic Alkalies in presence of Alkaline Carbonates, and of Quicklime in presence of Calcium Carbonate. G. Lunge. (*Chemical News*, xlvii. 188.) The author has examined a method first suggested by Degener. The solution of lime is coloured with phenacetolin, and normal acid is dropped in as long as the yellowness produced by each drop at once gives place to redness. If this change does not occur for a few seconds, the burette is read off, and two more drops of acid are added. If the liquid remains yellow, the former reading was correct; but if it becomes red, the addition of the acid must be continued until a permanent yellow coloration is established.

The determination of caustic soda is effected directly by titration with acid, using phenacetolin as indicator. As soon as the liquid remains of a faint rose colour, all the sodium hydroxide is saturated, and only the carbonate remains. If more acid is added, the yellowish red coloration changes suddenly to a golden yellow. At this point the carbonate also is saturated. The process is most suitable for caustic lyes which contain moderately large proportions of carbonate.

Ammonia behaves differently from caustic soda, and is at once reddened by phenacetolin.

The author recommends practice with this indicator with liquids of known composition, so as to acquire a knowledge of the correct shade of colour.

Quantitative Estimation of Potassium and Sodium. W. Knop. (*Chem. Centr.*, 1882, 347; and *Journ. Chem. Soc.*, 1882, 1132.) For some time the author has used hydrofluoric acid for the analysis of silicates, and he now proposes to use this acid for the determination of alkalis in non-siliceous substances. The required quantity of silicon fluoride is produced by adding hydrofluoric acid and pure silicic acid to the substances, in order to convert the potassium or sodium contained therein into metallic silicofluoride. The alkalis are then extracted by means of a mixture of alcohol and ether acidified with hydrochloric acid. Potassium and sodium silicofluorides are insoluble in this mixture, but the chlorides of the metals from which these alkalis have most frequently to be separated dissolve with ease in the same, and are removed by decantation. The advantage which this method has over that usually employed for determining potassium and sodium consists in the circumstances that these alkalis are at once concentrated in the form of a precipitate of small volume and weight, which may be collected on a small filter, and requires only a small quantity of water to wash it. The chief advantage, however, is that the solutions of the alkalis, which in order to recover the latter are finally evaporated as sulphates, can be prepared in a concentrated state. As an example of the mode of procedure, the author gives a description of the analysis of a mixture of the chlorides of potassium, sodium, iron, calcium, and magnesium. The results obtained are very satisfactory.

This method of determining potassium and sodium is of special advantage in cases where it is not intended to separate these alkalis directly, but where the result is calculated from the quantity of sulphates found, and the quantity of sulphuric acid contained therein as determined by barium chloride. The author has calculated the constant factors obtained by using Richter's equations, employing the atomic weights as recently corrected by Stas.

By taking—

$$\text{Na} = 22.98, \text{K} = 39.04, \text{Ba} = 136.80, \text{O} = 15.96$$

$$\text{Na}_2\text{O} = 61.92, \text{K}_2\text{O} = 94.04, \text{BaSO}_4 = 232.62, \text{SO}_3 = 79.86$$

and calling P the weight of sulphate obtained, x the quantity of

potassium oxide contained therein, y the quantity of sodium oxide sought, and S the quantity of sulphur trioxide determined by barium chloride and combined with $x + y$, so that therefore

$$(1) \quad P = x + y + S,$$

we obtain by making use of Richter's equations:—

$$(2) \quad y = S \times 4.19782 - P \times 1.9277.$$

In both equations S and P are quantities which can never be equal to 0; whilst $y = 0$ when the quantity of sulphate contains no sodium, and consists therefore of pure potassium sulphate; and *vice versa* $x = 0$ when pure sodium sulphate is present.

The preceding equation (2) can therefore be proved with great ease as to the utility of the two constant factors contained therein, by giving $P = 86.95$ half the atomic weight of potassium sulphate, $S = 39.33$ half the atomic weight of sulphur trioxide. In order to solve the second equation, y must equal 0, or $S \times 4.19782$ must equal $P \times 1.9277$. By calculating y in this manner with the use of the equation,—

$$y = 39.93, 4.19782 - 86.95, 1.92777,$$

we obtain for both products agreeing with one another to the second decimal place—

$$y = 167.62 - 167.62, \text{ i.e. } = 0.$$

This test is of great importance, inasmuch as it confirms the accuracy of the atomic weights corrected by Stas.

The Employment of Hydrogen Peroxide in Chemical Analysis.

A. Classen and O. Bauer. (*Ber. der deutsch. chem. Ges.*, May 7th, 1883.) Hydrogen peroxide converts ammonium sulphide to sulphate, and, what is the same thing, its solutions, made alkaline with ammonia, oxidize sulphuretted hydrogen.

A number of metallic sulphides are very readily oxidized by an alkaline solution of hydrogen peroxide, without any intermediate precipitation. This is the case with the sulphides of arsenic, copper, zinc, and thallium. In the case of tin sulphide, the oxide of the metal is precipitated, while the whole of the sulphur is oxidized to sulphuric acid. Mercury sulphide, which is hardly attacked by nitric acid, is very readily oxidized by hydrogen peroxide. A solution of cadmium sulphide forms a yellowish white precipitate soluble in hydrochloric acid.

Several metallic sulphides. the solutions of which are precipitated

by ammonia, are decomposed by hydrogen peroxide into sulphuric acid and a hydroxide of the base, which precipitates, for instance, iron sulphide.

The authors believe that hydrogen peroxide will soon be generally employed in analytical operations, as a clean, handy, and energetic oxidizing agent. Amongst other determinations which yielded good results may be mentioned the determination, in the presence of sulphuretted hydrogen, of hydrochloric, hydriodic, and hydrobromic acids.

Estimation of Organic Matter in Potable Waters. L. W. McCay. (*Chemical News*, xlvii. 195.) In using Tidy's permanganate method for estimating the organic purity of waters, the author has always experienced a difficulty in ascertaining the precise moment of the disappearance of the blue colour of the iodized starch; to avoid this he has adopted the use of ammonium ferrous sulphate. The solutions he employs are: (1) 0.395 gram of permanganate in 1000 c.c. of pure water; (2) 4.90 grams ammonium ferrous sulphate in 975 c.c. of water and 25 c.c. of concentrated sulphuric acid. From several experiments the author is assured that the method is very good; the results are not only constant, but also agree well with duplicate analyses done by Tidy's method. The advantages claimed for the method are:—1. The abolition of the blue colour difficulty. 2. Saving of time. 3. Two solutions only are required. 4. The amount of chemically pure water necessary is reduced to a minimum. The ammonium ferrous sulphate solution keeps very well in the dark.

Determination of Organic Matter in Potable Water. J. W. Mallet. (*Journ. Chem. Soc.*, 1882, 1324.) This investigation was instituted at the instance of the American Government, with the object of examining the chief processes employed for estimating the organic matter, to test the absolute and relative accuracy of the results obtained by these processes, and to ascertain the nature and scope of the practical conclusions which may be secured. The processes employed were the "combustion," "albuminoid ammonia," and the "permanganate," as suggested by Forchhammer, but in the form advocated by Tidy. The waters examined were of various qualities, good and contaminated more or less, and artificially-prepared water containing animal and vegetable matter. Each analysis was made in triplicate, and the first portion of the report gives an account of the amount of concordance observed between the analyses of each sample as obtained by each individual process; in the combustion process there was found an average departure

from the mean of an individual determination for organic carbon 2·89 per cent., for nitrogen 7·09 per cent., but the departure in some cases far exceeds these figures; however, the results of the combustion process are less trustworthy for nitrogen than for carbon. The average departure from the mean in the albuminoid ammonia process was: free ammonia, 2·23 per cent.; albuminoid ammonia, 3·62 per cent. In Tidy's process the average divergence was: for oxygen consumed in one hour, 1·09 per cent.; for oxygen consumed in three hours, 0·56 per cent., showing a greater irregularity during the early stage than later. The permanganate yields, therefore, the most closely concordant results, whilst the combustion process yields the least.

Extent of Agreement of the Results obtained by the Different Processes with the Quantities of Organic Constituents known to be Actually Present.—The loss of carbon by the combustion process is considerable, and there is a strong tendency to excess of nitrogen; the loss of carbon is supposed to be due to the evaporation of volatile substances, such as butyric and valeric acids, which have been shown to be present in some contaminated waters; the excess of nitrogen is due to the presence of ammonia compounds, given off by the gas flame in the neighbourhood of the evaporating liquid; for although carefully covered, yet there is still a slight communication with the outside air by means of the notch in the rim of the water-bath for the passage of the feed-flask neck. Suggestions are made so as to show how this access of ammonia may be prevented by evaporating the water by steam, by evaporating the water in a vacuum, etc. The loss of nitrogen in Wanklyn's process is due to volatilisation of the amines during the first distillation, and as these compounds are not indicated by Nessler, they escape detection as "free" or as "albuminoid" ammonia. In order, therefore, to diminish this loss, a separate distillation should be made with alkaline permanganate added at once; also to avoid the uncertain ending of the collection of ammonia, the distillation should not be stopped until the last measure of distillate contains less than 1 per cent. of the whole ammonia already collected; several other alterations in the details of the process are also recommended. The analytical figures obtained by Tidy's process show that the putrescent substances are accurately determined, but not so the non-putrescent, as their oxidation by cold permanganate is so slow; on the other hand, by Kubel's method (oxidation at 100°), a loss of volatile matter occurs; it is proposed, therefore, to extend the time of oxidation to twelve or twenty-four hours at a temperature of 20°, examinations of the

amount of oxidation being made at intervals of one, three, six, and nine hours.

Effect on the Results of the Different Processes by Varying the Extent of Dilution of the same Organic Substances in Water.—Under this heading, we find that the weaker the solution the greater is the loss of carbon during evaporation, but the greater is the gain in nitrogen; hence, when applying Frankland's ratio, C : N, to a dilute water, the pollution would appear to be of animal origin; but the stronger the water is, the greater will be the tendency to refer the contamination to a vegetable source. In reference to Wanklyn's process, the weaker the solutions are, the higher are the results obtained for ammonia in both forms. The influence of dilution on Tidy's process is far less marked, but stronger solutions require somewhat less oxygen than is required by calculation. Among the special conclusions drawn concerning Frankland's process, we find that the formation of sulphuric acid from the sulphurous acid added during evaporation is of more frequent occurrence than is generally supposed. The combustion process, in its present form, cannot be considered as determining the carbon and nitrogen in water absolutely, as it is but as a method of approximation; but in many cases its indications of organic carbon are more valuable than those of the permanganate process, and its results for organic nitrogen more valuable than the indications afforded by the albuminoid ammonia process. The value of Wanklyn's process depends more on watching the rate and progress of evolution of the ammonia, than upon the determination of the total amount. The results obtained by Tidy's process are liable to variation with atmospheric temperature at the time of examination, and the amount of oxygen consumed is not a measure of the carbon present. The value of the results depends, as in the ammonia process, more on watching the rate and progress of the oxidation, than on the absolute amount of oxygen consumed.

General Remarks on other Chemical Determinations.—The estimation of total solids is liable to great error because of the large effect produced by slight differences in the dryness attained, or by atmospheric deposition on the platinum basin. Waters containing a high percentage of nitrates generally contain but little ammonia; Frankland's view that nitrates are not found in waters deficient in oxygen is in accordance with the results now obtained, with a few exceptions; nitrates are not always formed by reduction.

As the amount of carbon and nitrogen is so excessively small in any ordinary contaminated water, evil effects resulting from the

use of such a water cannot be due to chemical compounds, but rather to living organisms present at the same time; the presence of nitrates is not sufficient evidence for the condemnation of a water, but rather that of nitrites, which may be due to a special ferment, which is itself capable of propagating disease. From the presence of chlorides, contamination by animal or vegetable matter must only be determined with great caution. At present, attempts to determine the source of the contamination, whether animal or vegetable, have not been followed by very satisfactory results. Biological experiments show that such waters as are dangerous to animal life have a high C:N ratio. Tidy considers that the putrescent or easily oxidizable substances are of animal origin, whereas those less easily putrescent are vegetable matters; the author does not wholly agree with him, as he finds that the proportionate consumption of oxygen within the first hour is rather greater for those waters containing vegetable than for those containing animal matter, whilst one of the co-workers in the investigation—Smart—considers that the gradual evolution of albuminoid ammonia (Wanklyn's process) indicates organic matter, whether vegetable or animal, in a fresh condition; whereas a rapid evolution indicates putrescent organic matter. Finally, it is not possible to decide absolutely on the wholesomeness of a water by the mere estimation of organic matter. All samples should be examined without delay, as great changes may occur in the composition of the water, but samples should also be kept for ten or twelve days, and then examined, and their composition compared with that of the fresh sample.

The Analysis of Wine. J. Nessler and M. Barth. (*Zeitschr. für Analyt. Chem.*, xxi. 43.) An extensive paper divided into the following parts:—

1. The determination of the amount of extract.
2. A modification of Neubauer's test for potato sugar in wine, and the optical behavior of pure and saccharated wines.
3. Chlorine determination, and the amount of chlorine in wine.
4. Detection of free tartaric acid in wine.
5. Estimation of citric acid in wine.

For details reference must be made to the original paper, as the processes described are not suited for abstraction in this volume.

Detection of Sulphurous Acid in Wine. L. Liebermann. (*Ber. der deutsch. chem. Ges.*, xv. 439.) As a very delicate test for the recognition of this acid in wines and other similar liquids, the author recommends the following, which will indicate as little as 1 part in 500,000:—20 c.c. of the wine are distilled, the distillate

is diluted and shaken with a little chloroform and a few drops of iodic acid. If sulphurous acid is present, the chloroform will be coloured violet or pink from liberated iodine. Volatile organic acids or aldehydes do not reduce iodic acid under these circumstances.

Estimation of Glycerin in Wine by means of Copper Sulphate. R. Kayer. (*Rep. der Anal. Chemie*, December 1st, 1882, 353.) This is a modification of a method previously described by the author in the same journal, 1882, p. 145. The modified process is more rapid and more correct, the chief difference being in avoiding the necessity of separating the tartaric acid by milk of lime and alcohol. The method is as follows: 100 c.c. of wine (known to contain but a small quantity of sugar) are mixed with 100 c.c. of caustic potash solution (300 grams KHO + 600 c.c. H_2O), 100 c.c. of a solution of copper sulphate (200 grams per litre) are measured off, and a portion of this is added to the mixture slowly and while shaking, till the precipitate of cupric hydrate just ceases to dissolve. The flask containing the mixture is then heated upon the water-bath (not steam-bath) with an inverted condenser for half an hour, and then, after allowing to cool completely, the remaining portion of the 100 c.c. of copper solution is added, the precipitate separated by filtration, and washed, and the filtrate made up to 1 litre. The filtrate contains as much copper as corresponds to the quantity of tartaric acid and glycerin in the wine. To determine the copper in the filtrate, 300 c.c. or 400 c.c. of the filtrate are concentrated by evaporation, acidulated with sulphuric acid, and the copper precipitated by electrolysis. The deposit of copper at first obtained is redissolved and redeposited, as it contains an appreciable quantity of suboxide. A number of experiments have shown that 1 gram tartaric acid will keep 0.151 gram Cu in solution in the alkaline liquid. If we then know the quantity of tartaric acid in the wine, we can calculate the quantity of Cu this will hold in solution, and deducting this from the total copper in solution, we obtain that which is kept in solution by the glycerin. Experiments have shown that 1 gram of Cu = 1.834 gram of glycerin. The necessary data for the calculations are therefore:—

1 gram Cu	= 1.834 gram Glycerin.
1 gram Tartaric Acid .	= 0.151 gram Cu.
1 gram Cu	= 0.62 gram Tartaric Acid.

Jorissen's Reaction for Fusel Oil. K. Foerster. (*Ber. der deutsch. chem. Ges.*, xv. 230.) Jorissen detects fusel oil in spirits by the red coloration which the commercial oil gives with aniline

and hydrochloric acid. The author confirms this reaction, but shows that it is not due to amyl alcohol or its homologues, but to furfuraldehyde, which always occurs in fusel oil as an impurity.

Detection of Fusel Oil in Commercial Alcohol. H. Marquardt. (*Zeitschr. für Analyt. Chem.*, 1883, Part I.; *Chemical News*, xlvii. 179.) The author dilutes 150 grams of the alcohol to be examined with water, so as to bring it to from 12 to 15 per cent. of actual alcohol. He shakes it up with 50 c.c. chloroform for fifteen minutes, and draws off the chloroform. This process is repeated three times. The chloroform extracts are mixed together, and shaken up three times with an equal volume of water for fifteen minutes, in order to remove alcohol. The chloroform, which now contains no alcohol, but all the fusel oil, is mixed with a solution of 5 grams potassium bichromate in 30 grams water and 2 grams sulphuric acid, and heated for six hours to 85° on the water-bath in a strong, well-corked bottle, shaking frequently. When the oxidation is complete the contents of the flask and the washings are introduced into a distillation-apparatus, and distilled down to 5 c.c. The distillate is mixed with barium carbonate, and digested for about thirty minutes. The chloroform is distilled off, the residue is evaporated on the water-bath down to about 5 c.c., freed from the excess of barium carbonate by filtration, washed, and the filtrate is evaporated to dryness on the water-bath. The residue is dissolved with water and a few drops of nitric acid, so as to make up 100 c.c. In 50 c.c. the barium is determined, and in the other 50 c.c. the chlorine. The quantity of barium chloride corresponding to the chlorine is deducted from the total residue, and from the baryta of the rest the quantity of the fusel oil is calculated, so that 2 mols. amyl alcohol represent 1 mol. baryta.

Detection of Benzoic and Boric Acids in Milk. Dr. Meissl. (*Cosmos les Mondes*, April 7th, 1883; *Chemical News*, xlvii. 224.) For benzoic acid, 250 to 500 c.c. of milk are rendered alkaline by means of a few drops of lime or baryta water. The liquid is then evaporated down to a quarter of its bulk, made into a paste with a little plaster, and dried in the water-bath. Sand or pumice may be employed instead of the plaster. The dry matter is finely powdered, moistened with acidulated water, and agitated with twice its volume of cold alcohol at 50 per cent. The alcoholic extract contains the benzoic acid and the salts present in the milk. The liquid is neutralized with baryta water and concentrated to a very small volume. This residue is again acidulated with sulphuric acid, and finally agitated with small quantities of ether. The ethereal

extract submitted to evaporation leaves benzoic acid in a state of almost absolute purity. Boric acid is not capable of quantitative determination except present in such proportions that its weight may be deduced from the increase in the quantity of ash. The blowpipe reaction is useless, since the ash of pure milk gives a flame bordered with green. The following method is preferable:—100 c.c. are rendered alkaline with lime water, evaporated to dryness, and incinerated. The ash is dissolved in a minimum of strong hydrochloric acid, filtered over carbon, and reduced to dryness. The residue is moistened with a little weak hydrochloric acid, a little tincture of turmeric is added, and it is finally dried in the water-bath. The presence of the smallest trace of boric acid gives this residue a vermilion or cherry-red colour. Strong hydrochloric acid gives also a cherry-red with turmeric, but this colour disappears on the addition of water, and turns brown on drying.

Determination of Total Tartaric Acid in Crude Tartar. (*Zeitschr. für Analyt. Chem.*) Exactly 3 grams of the finely ground sample are mixed in a small beaker with 30 to 40 c.c. water and 2 to 2.5 grams potassium carbonate, and boiled for from ten to twenty minutes, with constant stirring. The acid potassium tartrate and the tartaric acid combined with calcium are thus converted into neutral potassium tartrate. The whole is introduced into a measuring cylinder or flask holding 100 c.c., cooled, made up to 100 c.c., shaken up, and after standing for some time, filtered through a dry filter into a dry flask. 50 c.c. of the filtrate are then evaporated down to about 10 c.c., mixed with 2 c.c. glacial acetic acid, and 100 to 120 c.c. of alcohol at not less than 95 per cent. To effect the complete separation of the bitartrate, the whole is well stirred for some time, and after standing is filtered. The residue is washed with alcohol of 95 per cent., until the washings, which run off after dilution with water, no longer show an acid reaction. The moist precipitate, together with the filter, is returned to the capsule, stirred up with water, heated to a boil, and titrated with normal soda. The number of c.c. consumed, multiplied by ten, gives the percentage of hydrated tartaric acid in the sample.

Estimation of Tannin. A. Gawalovski. (*Zeitschr. für Analyt. Chem.*, 1882, 552.) Like other investigators, the author arrives at the conclusion that the various volumetric methods of estimating tannin in natural and commercial products, cannot be relied on for accuracy. He much prefers the gravimetric estimation by means of copper sulphate. But instead of incinerating the precipitate and calculating the amount of tannin from the weight of the residual

copper oxide (by multiplying with 1.304), as it is usual to do, he recommends the precipitated, washed, and dried copper tannate to be weighed, then incinerated, and the weight of the copper oxide to be deducted from that of the precipitate. The difference represents the tannin.

Estimation of Tannin by Löwenthal's Method. F. Sirnand. (*Dingl. polyt. Journ.*, ccxliv. 391-400.) The author had occasion to make a number of tannin estimations according to Löwenthal's improved method, and found that the percentage of tannin in the same material was subject to certain variations, higher results being obtained when a larger quantity of material was boiled out. A series of experiments was therefore made, the object being to ascertain the cause of this discrepancy. The analyses were conducted in the following manner: The solution of potassium permanganate contained 1 gram per litre, 1 c.c. equal to 0.00135 gram tannin. It is standardized with iron, and the tannin equivalent calculated according to Neubauer's estimation (0.063 gram oxalic acid = 0.04157 gram tannin.) The indigo solution is prepared so that 20 c.c. require 18-20 c.c. of the solution of potassium permanganate. In titrating the tannin infusion, the author invariably used 20 c.c. of indigo solution, the advantage being that the liquid to be titrated gives the same yellow colour in each case, so that the eye gradually becomes accustomed to it. The gelatin solution is made according to Löwenthal's prescription; the filtration, however, is conducted according to Kathreiner's method. In preparing the infusion, the quantity of tannin should be regulated, so that 10 c.c. of the solution require 12 c.c. of potassium permanganate. Although it is unnecessary to adhere strictly to this strength, it is important to consider the quantity of tannin taken, and not to use too small a quantity, in which case the above-mentioned error would be multiplied. Again, it is not advisable to have the infusion in too concentrated a state, as the oxidation-products of the organic substances affect the yellow colour very considerably, and hinder the recognition of the end reaction. In order to ascertain whether the extraction has been complete, ferric oxide paper is used, *i.e.*, strips of filter-paper are steeped in a solution of 1 gram ferric chloride, and 1 gram sodium acetate in 100 c.c. water, and dried in the air. This paper gives a distinctly visible black stain with a solution containing 1 part of tannin in 10,000 parts of water. With a smaller quantity, a black ring is produced round the drop of the solution poured on filter paper. The acidulated water used contains in 100 c.c. 3.786 grams H_2SO_4 .

The analysis is made as follows: 10 c.c. of the infusion are treated in a shallow porcelain basin with 1 litre of water and 20 c.c. indigo solution. Potassium permanganate is then added slowly, drop by drop, until a yellow colour, with faint reddish tinge, is produced. To determine the oxidizable "non-tannin" constituents, the tannin in 50 c.c. of the infusion is precipitated with 50 c.c. of gelatin solution, saturated with salt, and 25 c.c. acidulated water. After shaking up and allowing to stand for some time, the mixture is filtered. 25 c.c. of the clear filtrate (corresponding to 10 c.c. infusion) are then treated with 1 litre of water and 20 c.c. indigo solution, and titrated with potassium permanganate. By deducting from the quantity of potassium permanganate used in the direct titration the quantity consumed in the second titration, the number of cubic centimetres required to oxidize the tannic acid in 10 c.c. of infusion is obtained. As the volume corresponding to a certain weight of extracted material is known, and the potassium permanganate value of the tannin has been determined previously, it is easy to calculate the percentage of tannin in the tanning materials, provided that in the gelatin filtrate the "non-tannin" bodies only are titrated. This, however, was found not to be the case. The consumption of potassium permanganate in titrating the gelatin filtrate is mainly due to the solubility of the "gelatin tannate" in dilute sulphuric acid. The author is investigating this point with a view of remedying it.

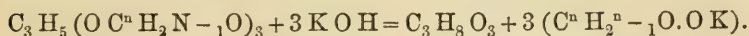
Analysis of Fats. K. Zulkowsky and M. Gröger. (*Ber. der deutsch. chem. Ges.*, May 21st, 1883.) The authors have simplified Haussmann's process, which is based upon the fact that an alcoholic solution of a fatty acid is immediately saponified on the addition of an alcoholic solution of caustic potash, whereas the saponification of a neutral fat can only be effected by protracted boiling. When an alcoholic solution of fatty acids and neutral fats, to which some phenolphthaleine has been added, is titrated with caustic potash, the red colour disappears as long as any fatty acid is present, and the solution does not attain a permanently red colour until all the fatty acids are saponified. When the red colour has set in, an excess of caustic potash is added, and the whole boiled for half an hour to saponify all the neutral fats, and re-titrated, whereby the amount of caustic potash required to effect the saponification of the neutral fats is ascertained, and the quantity of caustic potash required for each titration represents the relative proportion of fatty acids and neutral fats in the mixture operated on.

Not only is the method useful in ascertaining the relative pro-

portions of fatty acids and neutral fats in a given mixture, but it also serves for testing fats generally, as, for instance :—

1. For determining the equivalent of a fat, *i.e.*, the proportion saponifiable by an equivalent of caustic potash, or 1 litre of a normal solution of potash. The result obtained might, under some circumstances, serve as a criterion as to the nature of the fat. The equivalent would, no doubt, in the case of butter-testing, indicate whether the butter was genuine or artificial.

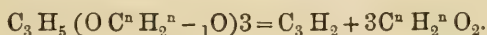
2. For determining the amount of glycerine (theoretical yield) in fats in the most simple manner imaginable. When a neutral fat, or a mixture of a number of such fats, is saponified, the following reaction takes place :—



According to the above equation, every litre of normal potash solution splits up one-third equivalent of glycerine—*i.e.*, 30.667 grams. 1 c.c. of normal potash is therefore equivalent to 0.030667 grams of glycerine.

3. The amount of glycerine a fat would probably yield having been ascertained by the above titration, and provided the fat is pure and free from moisture, the theoretical yield of fatty acids would be easily calculated.

Triglycerides may be considered to split up in the following way :—



On comparing this equation with the one above, 1 litre of normal potash represents one-third equivalent of glycerine residue, C_3H_2 —*i.e.*, 12.667 grams. Supposing v. c.c. of normal potash to have been employed, the weight of the glycerine residue would be (0.012667 v.), which may be represented by the letter *g*, and let *F* represent, in grams, the original weight of the fat; then *F* - *g* will represent the yield of fatty acids to be expected from it.

Use of Finely-Divided Lead for the Examination of Drying Oils.

A. Livache. (*Moniteur Scientifique*, March, 1883; *Chemical News*, xlvii. 202.) The lead is obtained by precipitating with slips of zinc a 10 per cent. solution of lead nitrate acidulated with a few drops of nitric acid. The precipitate obtained is agitated for a few moments with distilled water, washed by decantation two or three times; thrown into a funnel plugged with glass wool, washed quickly, first with alcohol and then with ether, and dried in a vacuum over sulphuric acid. To expel traces of ether it is lastly

exposed to the air in thin layers for about two hours. For the examination of an oil, 1 gram of the lead is spread out in a rather large watch-glass, and the oil in question is allowed to fall drop by drop from a pipette drawn out to a point, placing the drops in such a manner that a space may remain between them. The lead gradually sucks up the oil, so that every fragment is coated with an excessively thin film of oil. If the oil has been added in too great quantity it forms a thick coating, which dries at the surface, and forms a solid pellicle, which protects the lower part. About 2 parts of oil at most should be used for 3 parts of lead. The watch-glass should have been first tared; the lead is then weighed, and afterwards the oil added. The watch-glass is then exposed to a mean temperature and to full light, which materially aids oxidation. With drying oils the increase of weight sets in after about eighteen hours, and is generally at an end after three days, when it remains constant. With non-drying oils the weight generally does not begin to vary until after four or five days. numerous series of experiments have shown the following numbers as the limits of the increase of weight of oils in presence of finely-divided lead: Linseed, 14 to 15·5 per cent.; nut, 7·5 to 8·5; cotton 5 to 6; beech-nut, 4 to 5 per cent. The non-drying oils give an increase of weight from 1 to 3 per cent., and it is only after the lapse of some months that we find an increase of 4 to 5 per cent.

Effects of Oils on Metals. C. W. Volney. (*Analyst*, April, 1883.) The author's experiments were undertaken with the object of establishing the relative value of different oils, not only as lubricators, but also as protectors of the different metals.

EFFECT ON BRASS.—Strips of sheet brass were covered, each separately, with oil. The temperature was 81° F. The strips of metals were weighed; the temperature was kept uniformly at 81° F.; after sixteen days the metal was removed from the oil and carefully washed with alcohol, dried and weighed.

1. *Menhaden Oil.*—Weight of metal, 0·590. The oil had become thick, gummy, and covered with a tough skin. After cleaning and drying the metal weighed 0·587; loss, 0·003. The metal itself was covered with a green film; the colour of the oil was unchanged.

2. *Crude Cottonseed Oil.*—Weight of metal when immersed, 0·574. The oil had retained its original consistency. The metal was covered with a green film; the colour of the oil was unchanged. Weight of metal after washing and cleaning, 0·572; loss, 0·002.

3. *Lard Oil.*—Weight of metal when immersed, 0·572; the oil showed no change of consistency or colour; there was only a slight

tinge of green on the metal, which weighed after washing and cleaning, 0·5715; loss, not quite 0·001.

4. *Olive Oil*.—Weight of metal before immersion, 0·794. The oil was green from dissolved oleate; the metal was thickly covered with green film. Weight of metal after washing and cleaning, 0·790; loss, 0·004.

5. *Neatsfoot Oil*.—Weight of metal before immersion, 0·791; no change in colour or consistency of oil, but a green residue or precipitate had collected on the bottom of the glass; the metal was covered with green oleate. Weight of metal after washing and cleaning, 0·787; loss, 0·004.

6. *Crude Petroleum from Scio*.—Weight of metal before immersion, 0·717. No change was observed in consistency or colour of the oil, and there was no change in the appearance or colour of the metal. Weight of metal after washing and cleaning, 0·717; loss, none.

The foregoing trials express in themselves the fact that the mineral oils form the best protectors for brass. The figures obtained by expressing the loss caused by the oils upon the metal, give also the relative value of the oils in this respect. Reduced, the following table is obtained, which may be considered as an indicator of the dissolving or corroding effect of these oils upon brass:—

Menhaden Oil	·511
Neatsfoot Oil	·505
Olive Oil	·504
Crude Cottonseed Oil	·348
Lard Oil	·131
Crude Petroleum from Scio	·000

These figures express the chemical effect of these oils upon brass, and thus give values for the estimation of these oils as protectors of metals; to form estimates of their values as lubricators, the above obtained factors will doubtless prove valuable, but the mechanical action in friction will have also to be considered.

It should be borne in mind that the numbers here given throw no light on the action of other oils not investigated, as the acidity of the different vegetable and animal oils varies. Probably the results of their effects upon metals will differ; but in general it may be stated that these oils in course of time will invariably show acidity, and in this respect only mineral oils are excepted.

Dialysis with the Application of Chloroform, Water, or Ether, and its Significance for the Analysis of Vegetable and Animal Albuminoids. H. Struve. (*Journ. für prakt. Chem.*, 1883, No. 4;

Chemical News, xlvii. 281.) The author ascribes the imperfect success which has attended dialytic researches on the albuminoids to three causes: the instability of the substances, the use of parchment paper, and the difficulty of examining the substances which pass through the dialyser. To meet the first difficulty, of which all experimentalists have been aware, the operation has always been carried out at the lowest practicable temperature, as quickly as possible, and with frequent renewal both of the external liquid and of the parchment paper. The difficulty of meeting with a good parchment paper of uniform quality is well known. The author considers that the distinction between colloid and crystalloid substances, as proposed by Graham, cannot be maintained. For the membrane he selects the bladders of animals. He softens them in water, frees them mechanically from fat as completely as possible, and then treats them repeatedly with ether. Bladders thus prepared and submerged in ether retain their good qualities for years. For the external fluid he recommends water which has been shaken up with an excess of chloroform, and allowed to separate on standing. It prevents, or at least retards, chemical changes in the substances operated upon.

The Testing of Commercial Albumen. A. H. Allen. (*Analyst*, 1882, 209.) Commercial albumen is liable to adulteration with gum, dextrin, flour, sugar, etc. For its examination, 5 grams of the powdered sample should be treated with 50 c.c. of cold water, with frequent stirring, until all soluble matter is dissolved. Pure and good samples leave no residue. A few drops of acetic acid should next be added, and any undissolved matter filtered off through silk or fine muslin. It may consist of coagulated albumen, casein, starch, or membranous matter. The casein may be dissolved out by treatment with very dilute caustic soda, and precipitated by exactly neutralizing its solution with acetic acid. The aqueous solution of the sample is boiled, when the albumen is thrown down as a flocculent precipitate, which may be filtered off, washed, and weighed; or ignited with soda-lime, and the albumen deduced from the ammonia obtained. The filtrate should be treated with acetic acid and potassium ferrocyanide to make sure that no albuminoid remains in solution. Its absence being proved, tannin may be added to precipitate any gelatin; and the filtrate concentrated to a small bulk, and treated with alcohol to precipitate any gum or dextrin, while sugar, if present, will remain in solution in the alcoholic liquid, and may be detected by boiling off the alcohol, heating with hydrochloric acid, and testing the liquid with

Fehling's solution. Sugar might also be extracted by treating the original solid sample with alcohol.

Ziegler's method of assaying commercial albumen is to dissolve 20 grams of the sample in 100 c.c. of cold water, strain through a sieve, and add 10 c.c. of the clarified liquid to a boiling 20 per cent. solution of alum. After noting the appearance and volume of the coagulum, it is washed, dried, and weighed. De Coninck (*Journ. Chem. Soc.*, xxv. 1129) finds that the process gives a precipitate containing not more than 1 per cent. of albumina, and that it is sufficiently accurate for the purposes of the calico-printer. With pure albumen very good results are obtainable, and their accuracy is not affected by the presence of dextrin, but gum arabic prevents the precipitation of albumen to a very notable extent. The proportion of ash cannot be readily ascertained by direct ignition of the albumen, owing to the fusible nature of the carbonate of sodium and other salts of which the ash is mainly composed. The difficulty may be obviated by treating a weighed quantity of the sample in a porcelain crucible, with nitric acid of 1.42 specific gravity, and two or three drops of strong sulphuric acid. On heating gently, the albumen dissolves to a clear yellow liquid, which may be evaporated to dryness without trouble, giving a residue which readily burns and leaves an ash of tolerably high melting point. Operating in this manner, J. C. Belcher obtained in the author's laboratory the following percentages of "sulphated ash" from a series of samples of commercial albumen manufactured by a leading firm:—

	Sulphated Ash, per cent.			
"No. 1" Egg Albumen	7.4
"No. 2" " "	7.0
"Refined" Blood Albumen	9.1
"Prime" " "	8.5
"No. 1" " "	9.2
"No. 2" " "	8.9
"No. 3" " "	9.7
"Black" " "	6.2

All the ashes were white, except that yielded by the black albumen, which gave a reddish ash, owing to the presence of blood-corpuscles in the original sample. Curiously enough, in this, the lowest grade of genuine albumen, the ash is less than in the better kinds.

Volumetric Estimation of Albumen in Urine. C. Tanret. (*Lancet*, Oct. 14, 1882, 614.) The process consists in the precipitation of the albumen from the urine, previously acidulated with

acetic acid, by means of a solution of double iodide of mercury and potassium. The formula for the solution, 0.05 gram, of which is calculated to precipitate 0.005 gram of albumen, is—potassium iodide, 3.22 grams; mercuric chloride, 1.35 gram; water to 100 c.c. In applying the test, 10 c.c. of urine are taken, into which 2 c.c. of acetic acid are stirred with a glass rod, and the test liquor is run in from a pipette discharging 0.05 c.c. at a time, until the precipitate formed is no longer redissolved by stirring; when this point is reached, a drop of urine is taken after each fresh addition and placed in a watch-glass with a minute quantity of a 1 per cent. solution of mercuric chloride. The precipitation is completed when a yellowish red colour is observed in the watch-glass, due to the formation of red iodide of mercury. The number of 0.05 c.c. added, after deducting three as having been used in excess, if reckoned as half grams, will represent the quantity of albumen in a litre of the urine. The test may be effected by the presence of alkaloids in the urine, but the precipitate formed in consequence will dissolve either on the application of heat or the addition of alcohol.

Estimation of Urea by Sodium Hypobromite. C. Arnold. (*Archiv der Pharm.* [3], xx. 356-361.) The decomposition of urea in Hüfner and Simpson's apparatus is greatly facilitated by an excess of alkali in the solution. An excess of bromine above 45 c.c. per litre ceases to raise the results when the bromine solution contains a definite amount of alkali. An excess of alkali is more advantageous than an excess of bromine. Hüfner's apparatus yields as good results as Simpson's only when the solution contains 1 per cent. urea. In cases where pure urea is to be estimated, the Bunsen-Salkowski process is the best. Compared with a direct estimation of urea by soda-lime, Hüfner's method yields results 9 per cent. too low. Comparisons of nitrogen in urine estimated by soda-lime, Liebig-Pflüger and Hüfner-Knop's method, the soda-lime results being the standard, show that Liebig's process gives a result more than 0.5 per cent. too low, and Hüfner's nearly 7 per cent. below the true quantity. It is therefore evident that Hüfner's method is not adapted for exact scientific work.

New Process for the Determination of Urea. L. Hugouenq. (*Moniteur Scientifique*, xiii. 590.) 5 c.c. of the urine, previously filtered through purified animal charcoal, are heated with 15-20 c.c. of water to 190° C. in a closed tube. The ammonia thus formed is then estimated by titration with standard normal sulphuric acid.

The number of c.c. of acid required, multiplied by six, give the weight in grams of urea contained in one litre of urine. Albuminous urines must first be boiled to coagulate the albumen. Urines containing sugar or large quantities of magnesia are not adapted for this process.

Influence of Gum Arabic in certain Chemical Reactions. J. Lefort and P. Thibault. (*Journ. de Pharm. et de Chim.* [5], vi. 169-174; and *Journ. Chem. Soc.*, 1882, 1322.) Mercuric sulphide is rapidly precipitated when mercuric chloride is added to the sulphur springs at Bagnères de Luchon; but if to the waters solutions of gum arabic, sarsaparilla, wild pansy, beef tea, albumen, or apple jelly be added, no precipitation will take place on addition of mercuric chloride.

It was thought interesting to study the solvent action of gum arabic on the sulphides of other metals, with the view of ascertaining whether this property is peculiar to the waters of Luchon. At first the non-precipitation of mercuric chloride was attributed to the viscosity of the solution, but this is disproved by the fact that if gum arabic be replaced by glycerol, a precipitate is produced.

Decinormal solutions of sodium sulphide and different metallic salts, and a solution of gum arabic (1 to 2), were prepared. In each case 10 c.c. of the metallic solution were treated with 3 c.c. of the gum solution; and to another equal volume, 3 c.c. of distilled water was added. To each of these, 10 c.c. of the sulphide solution was added, with the following results:—

	Without Gum.	With Gum.
Lead Acetate	Black precipitate	Brown solution
Silver Nitrate	" "	Black "
Ferrous Sulphate	" "	" "
Manganese Sulphate	Flesh coloured precipitate	Light brown solution
Mercuric Chloride	Black precipitate	Dark " "
Copper Sulphate	" "	" " "
Zinc Sulphate	White "	Colourless "
Antimony Trichloride + H Cl	Orange "	Orange coloured "
Arsenic Trioxide	Lemon yellow precipitate	Lemon yellow "

Under the above conditions, gum arabic prevents the precipitation of metallic sulphides, but in more concentrated solutions, or in presence of very small quantities of gum, precipitation, more or less incomplete, takes place. Metallic hydrates, in presence of gum arabic, behave in a similar manner to the sulphides.

The formation of other precipitates is also prevented, as that of

calcium phosphate in neutral solutions, uranium ferrocyanide, and ferric hydrate when a dilute solution of ferric chloride is treated with ammonia. The alkaloids quinine, cinchonine, morphine, strychnine, brucine, veratrine, are not precipitated by phosphomolybdic acid, potassium mercuric iodide, or tannin, in presence of gum arabic. The non-precipitation of dilute solutions in presence of gum arabic is, however, not absolutely general, lead iodide, mercuric iodide, barium sulphate, and lead carbonate being precipitated in presence of the gum, although more slowly than when it is absent.

The intense colorations produced on adding the reagent to the metallic solutions containing gum, shows that a reaction has taken place; it therefore remains to be proved whether the precipitate is soluble in gum arabic, or held in suspension in an exceedingly fine state of division. The authors are inclined to think the latter is the more probable, since concentrated solutions of gum arabic fail to dissolve the precipitated substances, even when recently formed.

From a physiological point of view, this solvent action is interesting, since it throws a light upon the existence of insoluble bodies, such as phosphates, oxide of iron, etc., in solution in the animal and vegetable juices.

It is important to notice that the ordinary method of estimating gum arabic by precipitation with lead acetate, and decomposing the lead compound with sulphuretted hydrogen, cannot yield accurate results. It is better to decompose the lead compound by boiling it with a concentrated solution of ammonium carbonate.

Methods of Microchemical Research. A. Tschirch. (*Archiv der Pharm.* [3], xx. 801. From *Pharm. Journ.*) The author thinks that microchemistry must always be distinguished by a series of colour reactions; that in the same manner as the changes of colour, etc., in experiments on the large scale are examined in the test tube, so that they must be similarly observed on the slide of the microscope. The actual process is simple. The objects to be examined must be either in thin sections, fine powder, or as fibres, a drop of the reagent is placed on a slide and allowed to flow slowly towards the object, the operator observing through the instrument. Many physical as well as chemical changes may thus be detected: expansion or contraction, refractive changes, commencement of coloration, evolution of gas bubbles, solution, etc. The iodine starch reaction of Stromeier was the first to be employed with the microscope; from it is learned the topography and division of starch in plants, the way it is stored up, and the process of its conversion;

this reaction has also taught the difference between pure cellulose and woody fibre and the nature of intercellular substance. The reactions with zinc chloride and iodine, and with sulphuric acid and iodine, are also striking instances of the value of microchemistry, affording an easy method of distinguishing vegetable from animal fibres, the first colouring pure cellulose violet, and the second dissolving it with an intensely blue colour, the lignin encrusting the fibres having been previously removed by maceration in nitric acid, alkalies, or Schultze's maceration fluid. Thus sulphuric acid and iodine stain cork dark yellow, thereby affording a trustworthy test for all membranes or sections containing suberin. The solubility of pure cellulose in "cuoxam," discovered by Schweitzer, is also credited to microchemistry; the reagent may be prepared by digesting copper turnings in concentrated ammonia, or by decomposing a concentrated solution of copper sulphate with ammonia until the precipitated hydroxide is redissolved.

The maceration process of Schultze is a valuable aid to operations in microchemistry; the substance is treated with nitric acid and potassium chlorate, either in the cold, or, in cases of obstinate samples, is boiled for a short time, when the cells are isolated by the solution of the intermediate lamellæ. Amongst the instances given of its utility in food analysis, is the separation of those peculiar cells of radiating branchial form which exist in the tea leaf, and are not found in other leaves used for its adulteration (they are, however, found in some of the camellia family).

This treatment has also the advantage of dissolving the coloured incrustations of cinnamon, roasted coffee, etc., and leaving the substances ready for further examination. Potash plays an important part in microchemistry, as it renders many objects transparent which are not made so by other reagents; it was by successive treatment with potash solution, acetic acid, and iodine, that Böhm was able to perceive in chlorophyll the small particles of starch which had hitherto escaped observation. The most striking success in the science is that of Sachs with Trommer's sugar test, which, with slight modifications, enables the microscopist to identify, and even estimate quantitatively, cane- and grape-sugar, dextrin, gums, and albuminous substances in single cells.

The author alludes to the tinctorial methods which are employed in the examination of microbes, but which do not come under the strict domain of chemistry; he urges more extensive use of the microscope, together with the micropolariscope and spectroscope, and the study of botany and physics amongst chemists.

The Use of Bromine in Testing for Alkaloids. C. L. Bloxam, (*Chemical News*, xlvii. 215.) If the alkaloids be dissolved in dilute hydrochloric acid, and tested with bromine water, the following reactions are observed.

1. *Strychnine*.—A yellow precipitate, which is dissolved by boiling. If bromine water be added drop by drop, and the solution boiled between each addition, a fine violet colour is produced; the slightest excess of bromine bleaches it, but the colour returns on boiling.

2. *Brucine*.—A violet colour in the cold, followed by a yellow precipitate on adding more bromine.

3. *Narcotine*.—A copious yellow precipitate, even in weak solutions. If bromine water be added by degrees, and the solution boiled, a rose-pink colour is obtained, easily distinguished from the violet furnished by strychnine.

4. *Quinine* behaves like narcotine, but is not so easily precipitated by bromine water. If the quinine solution, after addition of excess of bromine, be covered with weak ammonia, the characteristic green colour is seen at the plane of junction of the liquids.

5. *Morphine* is not precipitated by bromine water unless the solution be rich in morphine. If an excess of bromine water be added, the solution boiled, a piece of zinc or tin introduced, the liquid again boiled for a minute or two, cooled, and weak ammonia poured in so as to float upon the surface of the liquid, a delicate pink band of colour is seen at the plane of junction, and is diffused through the liquid on shaking the tube.

6. *Cinchonine* in strong solutions gives a yellow precipitate with bromine water, but no characteristic reaction.

The following process of testing has enabled the author to distinguish with certainty between the above alkaloids dissolved in large excess of dilute hydrochloric acid, and presented as unknown solutions:—

To the solutions of the alkaloid in hydrochloric acid—

1. Add ammonia in *slight* excess. Precipitate: cinchonine, narcotine, quinine. Dissolved in large excess: quinine.

2. Add bromine water from the end of a glass rod. Violet colour: brucine. Yellow precipitate: *probably* strychnine or narcotine. Boil, and continue to add bromine water in very small portions, boiling after each addition. Violet colour: strychnine. Rose colour: narcotine or quinine. Add bromine water in excess and boil; divide the solution into two parts—

- (a) Cool, and float weak ammonia on the surface. Green colour : quinine. White precipitate : cinchonine or narcotine.
- (b) Add a fragment of metallic zinc, boil for a minute or two, cool, and float weak ammonia on the surface. Pink colour : morphine.

Bromine water of convenient strength is made by shaking 30 drops of bromine with 8 ounces of water.

The author has not succeeded in obtaining in a pure state the fine colouring matter produced by brominating morphine and reducing with zinc or tin in hydrochloric solution. The colour is produced without addition of ammonia if the liquid be treated with excess of zinc; it is bleached by boiling, but returns on cooling; hydrochloric acid also bleaches it, but ammonia restores it.

Putrid Fermentation, and the Alkaloids produced by it. A. Gautier and A. Etard. (*Comptes Rendus*, xciv. 1598—1601; *Journ. Chem. Soc.*, 1883, 224.) The authors consider that the apparently complex phenomena of putrid fermentation may be explained by regarding putrefaction as a breaking up by hydration of the complex albuminoid molecule into the simple nuclei which enter into its composition. As in the results Schützenberger obtained with barium hydroxide, so by the action of the bacteria, the albuminoid molecule splits up first into two principal parts; one of these is relatively stable, giving rise to the glucoproteins and leucines to which Schützenberger attributes the formula $C_n H_{2n} - 4 N_2 O_2$, whilst the other is unstable, and decomposes rapidly, with formation of ammonia, carbonic anhydride, and formic, acetic, and oxalic acids. But whilst Schützenberger's method is incapable of hydrating the amides formed,—the leucines and leuceines,—bacteria slowly change them into ammoniacal salts, and also by the hydration of the crystalline body, $C_{11} H_{26} N_2 O_6$, produced abundantly in the putrefaction of fish.

Putrefaction being essentially a process of hydration, it follows that the aromatic derivatives and the bases formed during the fermentation pre-exist as nuclei in the albuminoid molecule. In order to obtain the bases, the liquid products of putrefaction of the skate are acidulated with sulphuric acid and evaporated in a vacuum, whereby indole, phenol, and other volatile products are removed, the residue is then treated with baryta and chloroform, which dissolves the bases. After purification, they are colourless oily liquids having all the characters of the bases described by Selmi. They have an odour like that of the carbylamines, recalling that of hawthorn and hydrocollidine, resinify rapidly, and give the

reactions of the ptomaines. The hydrochlorides crystallize well, and yield sparingly soluble crystalline platinochlorides.

By fractionation two bases were isolated, one having the formula of parvoline, $C_9 H_{13} N$, and yielding a platinochloride which becomes rose-coloured on exposure to the air, the other, an oil boiling at about 110° . The latter gives a hydrochloride crystallizing in slender needles of bitter taste. The platinochloride is pale-yellow and sparingly soluble; the aurochloride is very unstable. Although the analytical results agree better with the formula $C_8 H_{11} N$, the author assigns to this base the formula $C_8 H_{13} N$, as the boiling point, viscosity, and general properties so very closely resemble those of Cahours and Étard's hydrocollidine, with which he believes it to be isomeric.

From these considerations, the occurrence of indole and of pyridic and hydropyridic bases amongst the products derived from albuminoids by putrefactive hydration, the authors feel compelled to admit the existence of the homologous series, $C_5 H_5 N$ and $C_5 H_7 N$, in the radicles of the proteid molecule.

Contribution to the Knowledge of the Alkaloids produced by Putrefaction. L. Brieger. (*Zeitschr. für Physiol. Chem.*, vii. 274-281.) If pepton, which has been obtained from fibrin by the action of the gastric juice, and free from putrefaction products (indol, phenols, oxyacids), is evaporated, extracted with boiling alcohol, and the residue remaining after the evaporation of the alcohol taken up with pure hot amyl alcohol, filtered and evaporated, there remains an amorphous mass which possesses strongly poisonous properties. The substance is readily soluble in water, but insoluble in ether, benzol, and chloroform. The aqueous solution affords a white precipitate with phospho-molybdic and phospho-wolframic acids, a yellow precipitate with potassio-cadmic and potassio-mercuric iodides, and a red precipitate with cadmium-bismuth iodide. Auric and mercuric chlorides also produce precipitates in the solution, but not platinic chloride. Iodine solutions give brown precipitates, tannin colours the solution brown, ferricyanide of potassium and ferric chloride blue. The white precipitate obtained by Millon's reagent becomes intensely red on boiling. The toxic subcutaneous dose of the evaporated extract is for frogs, 0.05 to 0.1 gram, and for small rabbits, 0.5 to 1 gram, death being preceded by a condition of paralysis and drowsiness. The poisonous substance was also prepared once from Witt's dry pepton, but subsequently its preparation from this pepton was no longer successful, and it was confirmed that also this pepton possessed of itself

absolutely no poisonous properties, although by the renewed action of artificial gastric juice it afforded small amounts of the poison. The same toxic substance may be prepared from putrefied albuminous bodies, such as fibrin, casein, the brain, liver, and muscle flesh. The poisonous substance which has recently been repeatedly observed in urine, the author believes to be identical with that obtained from pepton.

The Isolation of Morphine in Forensic Investigations. F. B. Power. (*Pharm. Zeitschr. für Russland*, 1883, 49.). For the isolation of small quantities of this alkaloid in a pure state, the author recommends the following process:—

The finely-divided portions of the cadaver are repeatedly extracted with acidulated water (urine and other liquids being first concentrated by evaporation), the combined liquids filtered, evaporated to nearly a syrupy consistence on a water-bath, extracted with from 4 to 5 times its volume of 95 per cent. alcohol, again filtered, the filtrate freed from alcohol by distillation, the residue in the retort again filtered and then shaken with amylic alcohol as long as colouring matters continue to be abstracted. Thereupon the acid solution is heated to from 50 to 60° C., an equal volume of amylic alcohol added and agitated, the liquid then made alkaline with ammonia water, and again agitated for some time. After the separation and removal of the amylic alcohol from the aqueous liquid, the operation is repeated by agitation with a fresh portion of amylic alcohol. The amylic alcohol liquids are then distilled or allowed to volatilize on a water-bath, the residue evaporated to dryness, and, by the aid of a gentle heat, repeatedly extracted with slightly acidulated water. The acid liquids are then filtered, and the filter carefully washed. It is advisable to again agitate the acid filtrate with amylic alcohol, for the removal of the colouring matters, and then pour upon the separated acid liquid the above-mentioned mixture of 10 parts of anhydrous ether and 1 part of 95 per cent. alcohol, to make alkaline with ammonia water, and agitate. This agitation with ether-alcohol is to be repeated several times. In this way the morphine may be obtained so deprived of colouring matters that all the reactions for the alkaloid may at once be applied.

Forensic Chemical Determination of Gelsemine in Animal Liquids and Tissues. E. Schwarz. (*Journ. Chem. Soc.*; from *Pharm. Journ.*, 3rd series, xiii. 148–150.) The author in this paper does not seem to recognise any difference between *æsculin* and *gelsemic acid*, as is shown to exist by Wormley; and he gives a detailed account of the different reactions with reagents when various alkaloids are

employed, whereby gelsemine may be detected. The final colour produced by strychnine, sulphuric acid, and an oxidizing agent, is brick-red, while with gelsemine the colour is green; sulphuric acid containing iron shows no reaction with gelsemine or strychnine, but a blue-violet with quebrachine; Froehde's reagent, with gelsemine, brown changing to green; strychnine, no change; geissospermine and quebrachine, blue; sugar and sulphuric acid, with gelsemine, cherry-red; fats, biliary acids, aconitine, codeine, and delphinidine, the same; strychnine, no colour; quebrachine, deep cherry-red; iodic acid in sulphuric acid, gelsemine, strychnine, rose-coloured; brucine and aspidospermine, brick-red; quebrachine, dark violet. Several other tests are given. *Æsculin* (gelsemine?) may be found in all organs; and gelsemine in the stomach, intestines, blood, and liver. Both pass rapidly from the stomach into the blood, and thence into the urine. Gelsemine is distinguished from quebrachine by not being extracted by chloroform from acid solutions; the reaction with Froehde's reagent by sulphuric acid containing iron, and by the absence of *æsculin* (?) from quebracho bark.

A Research on the Alkaloid Gelsemine and some of its Crystalline Salts. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, xiii. 641.) The main features of this as differing from previous researches show,—

(1) That the alkaloid gelsemine can be obtained in a state of purity as a crystalline colourless solid, forming crystalline salts with acids.

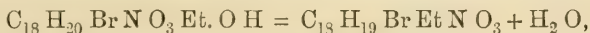
(2) That the pure base has the formula $C_{12}H_{14}NO_2$, thus differing greatly from the formula obtained by Sonnenschein, who it is certain must have used an impure substance, as shown by the colour reactions his alkaloid gave with nitric and sulphuric acids.

In cases of poisoning by gelsemium, where the resin, extract, or tincture have been employed, no difficulty need be experienced in detecting its presence, all these preparations containing gelseminic acid, which imparts its powerful blue fluorescence to any mixture on the addition of an alkali. When the alkaloid gelsemine has to be sought, its isolation can be effected by any of the methods followed for strychnine, especially taking advantage of the fact that gelsemine, like strychnine, is not destroyed by strong sulphuric acid. After isolation, and showing its alkaline and alkaloidal nature, its most special reaction would be the red colour with sulphuric acid and manganic oxide. These characters alone should scarcely be deemed sufficient evidence of its presence. In addition, its physio-

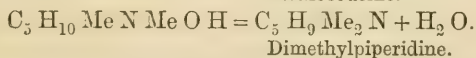
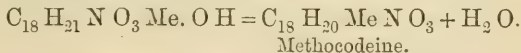
logical action should be demonstrated; if this also be obtained, the presence of gelsemine may be considered as established.

Morphine and Codeine. E. v. Gerichten and H. Schrötter. (*Ber. der deutsch. chem. Ges.*, xv. 1484-1488, and *Journ. Chem. Soc.*, 1882, 1112.) The authors having obtained phenanthrene from morphine by distilling it with zinc-dust, and being desirous of establishing the reaction as one of simple direct transformation, and the hydrocarbon therefore as the "dominant" of the morphine molecule, have applied to the solution of this point a reaction suggested by Hofman's researches on the pyridine bases, as follows:—

Bromocodeine was converted into the ethiodide, and this into the corresponding ammonium base. The latter on boiling was transformed with loss of water into the tertiary base, orthobromocodeine, according to the equation,—



analogous to the decompositions of the homologous methyl base, and of dimethylpiperylammonium hydroxide, as represented by their respective equations,—



The resulting tertiary base, ethobromocodeine, was converted into the methiodide, and the corresponding ammonium base heated for some time on the water-bath. It was found to be thus resolved into a mixture of bases, trimethylamine and others, and a non-nitrogenous body, $\text{C}_{15} \text{H}_9 \text{Br O}_2$, obtained in the crystalline state (m.p. 120°). On oxidation with chromic acid in acetic solution, this body yielded a quinone closely resembling phenanthraquinone.

Similar results were obtained with codeine itself. The products of resolution of the ammonium base were chiefly methyl-ethyl-propylamine and a non-nitrogenous body, $\text{C}_{15} \text{H}_{10} \text{O}_3$, obtained in colourless needles melting at 65° , and yielding phenanthrene on distillation with zinc-dust. The resolution of the base may be thus formulated:—



The authors withhold the more complete discussion of these results in their bearings on the constitution of morphine until that of the phenanthrene derivative is definitely established.

Morphine and Codeine. E. v. Gerichten and H. Schrötter. (*Ber. der deutsch. chem. Ges.*, xv. 2179–2183.) The object of this investigation was to examine the nature of the two non-nitrogenous bodies, $C_{15}H_{10}O_2$, and $C_{15}H_9BrO_2$, which the authors obtained from codeine and monobromocodeine (preceding abstract). Their insolubility in dilute alkalies pointed to their still containing the methoxyl-group present in codeine. An attempt to split off methyl from the compound $C_{15}H_{10}O_2$, by heating with hydrochloric acid, was unsuccessful. *Codethyline*, $C_{19}H_{21}NO_3$, treated by Hofman's reaction, yielded a non-nitrogenous body, $C_{16}H_{12}O_2$, homologous with the above-cited codeine derivative. Both these bodies yield phenanthrene—leaving no doubt of the presence of a methoxyl-group—when heated with zinc-dust, and may therefore probably be considered as phenanthrene derivatives. The following table shows the relationship of these compounds to the morphine alkaloids:—

Alkaloid.	Formula.	Non-nitrogenous derivative.	Hypothetical intermediate product between Non-nitrogenous derivative and Phenanthrene.	Phenanthrene.
Morphine . . .	$C_{17}H_{17}NO \begin{cases} OH \\ OH \end{cases}$	$C_{14}H_7O.OH$	} $C_{14}H_8O$	} $C_{14}H_{10}$
Codeine (morphine mono-methyl ether) .	$C_{17}H_{17}NO \begin{cases} OH \\ OMe \end{cases}$	$C_{14}H_7O.OMe$ m. p. 65°.		
Bromocodeine . .	$C_{17}H_{16}BrNO \begin{cases} OH \\ OMe \end{cases}$	$C_{14}H_6BrO.OMe$ m. p. 121–122°		
Codethyline (morphine mono-ethyl ether) . .	$C_{17}H_{17}NO \begin{cases} OH \\ OEt \end{cases}$	$C_{14}H_7O.OEt$ m. p. 59°.		

The authors consider this hypothetical intermediate product to have either the formula (i) $O \begin{matrix} C_6H_3 \\ | \\ C_6H_3 \end{matrix} > C_2H_2$ or (ii) $O \begin{matrix} C_6H_4 \\ | \\ C_6H_4 \end{matrix} > C_2O$, and taking into account the ease with which it is reduced by zinc-dust, they consider (ii) as the more probable. The non-nitrogenous derivatives of codeine and codethyline would then have the formula $O.R. \begin{matrix} C_6H_4 \\ | \\ C_6H_4 \end{matrix} > C_2O$ (where R = Me and Et respectively).

The non-nitrogenous derivative, $C_{14}H_7O.OEt$, obtained from codethyline, is insoluble in water, but soluble in ether, alcohol, and acetic acid. It crystallizes well, melts at 59° , and distils almost without decomposition. On heating it in sealed tubes, with the calculated quantity of hydriodic or hydrochloric acid, ethyl oxide or chloride is produced, together with a resinous mass from which a very small quantity of a body crystallizing in white needles was extracted, insufficient for investigation. $C_{16}H_{12}O_2$ is soluble in strong sulphuric acid to a yellow liquid, having a green fluorescence, and is reprecipitated unchanged on adding water. A nitro-derivative was obtained. $C_{16}H_{12}O_2$ is oxidized by chromic acid, and is easily reduced to phenanthrene by heating it with zinc-dust.

Derivatives of Morphine. E. Grimaux. (*Ann. Chim. Phys.* [5], xxvii. 273–288; *Journ. Chem. Soc.*, 1883, 358.) The substance of Part I. of this paper has already been abstracted (*Year-Book of Pharmacy*, 1881, 22).

PART II.—By acting on the sodium compound of morphine with ethyl iodide, *ethylmorphine*, $C_{17}H_{18}NO_3Et$, is obtained. This body is homologous with codeine, itself an ether of morphine, and the author therefore proposes the generic name *codeines* for this class of bodies. Codeine proper would then be *codomethyline*; the body under discussion, *codethyline*, etc. Codethyline crystallizes with 1 mol. H_2O in plates, soluble in boiling water, alcohol, and ether. At 83° it fuses to a clear liquid, which solidifies on cooling to a transparent vitreous mass. Heated for some time at 100° , it turns brown, and after cooling fuses at $55\text{--}60^\circ$. Its hydrochloride crystallizes in groups of needles. Sulphuric acid does not colour it. Heated to 20° with sulphuric acid and ferric chloride, it gives a blue colour, a reaction apparently common to all ethers of this class, and not, as Hesse suggested, confined to codeine proper. Dried in the air at the ordinary temperature, codethyline has the formula $C_{19}H_{23}NO_3.H_2O$, but loses $\frac{1}{2}$ mol. of H_2O in a vacuum. This seems to support Wright and Matthiessen's double formula. Heated with methyl iodide, it forms the addition-product,—



which, if treated with silver oxide, yields a tertiary base fusing at 132° , and giving with sulphuric acid the same reaction as methocodeine. Other halogen compounds, such as the alcoholic iodides, epichlorhydrin, allyl bromide, benzyl chloride, chloromethyl acetate, ethylene bromide, etc., give similar compounds with the sodium salt of morphine.

Ethylene-dimorphine, or *Dicodethine*, $(C_{17}H_{18}NO_3)_2C_2H_4$, crystallizes in small colourless needles, insoluble in ether, soluble in alcohol. On heating, it decomposes below 200° , without fusion. Heated to 20° with sulphuric acid and ferric chloride, it gives a blue coloration. Its hydrochloride crystallizes in small colourless prisms, easily soluble in water. With chloromethyl acetate, *oxacetylcodeine*, or *morphineglycollic acid*, $C_{17}H_{18}NO_3 \cdot C H_2 \cdot \overline{Ac} O$ is produced. This body, obtained as a deliquescent gummy substance, drying up in a vacuum to an amorphous mass, is very unstable, and decomposes on being boiled with water.

When codeine methiodide is treated with silver oxide, it yields a compound which seems to be an ammonium base. On evaporating the product in a vacuum on a brine-bath, an oil is deposited, partially crystallizing on complete evaporation. From this residue ether extracts a substance of the formula $C_{19}H_{23}NO_3$, crystallizing in bright plates, and having all the properties of a tertiary base; it appears to be formed by the dehydration of methylcodeine hydroxide, and to be analogous to some bodies obtained by Claus from the cinchona alkaloids. *Methocodeine* fuses at 118.5° , and soon turns brown if kept at this temperature. Codethyline methiodide, if treated with silver oxide, yields a base analogous to methocodeine, but melting at 132° .

With aldehydes, morphine yields compounds similar to those obtained by Baeyer with the phenols. If morphine is treated with methylal or chloromethyl acetate, it forms a compound apparently of the formula $C H_2 (C_{17}H_{18}NO_3)_2$. The ethers of morphine form similar compounds. Benzaldehyde appears to act in like manner.

The Solubility of Morphine Salts. D. B. Dott. (*Pharm. Journ.*, 3rd series, xiii. 401.) The author's results are summarized in the following table:—

Solubility of Morphine Salts at $60^\circ F$.

Acetate . .	1 part is soluble in $2\frac{1}{2}$ parts water.
Tartrate . .	" " $9\frac{3}{4}$ "
Sulphate . .	" " 23 "
Hydrochloride.	" " 24 "
Meconate . .	" " 34 "

Reaction of Narceine. M. Arnold. (*Journ. de Pharm. et de Chim.*, Dec., 1882. From *Chemical News*.) If a trace of narceine is heated with a mixture of equal parts of sulphuric acid and of phenol, we obtain at first a yellow coloration, then a brown, and when the phenol begins to volatilise a fine cherry-red colour if the action of

the heat is continued. Some drops of water suffice to transform this colour into a dirty yellowish white. Veratrine, if similarly treated, gives the same red coloration, but on the addition of water it gives a canary yellow. Codeine becomes a dirty violet-red, and of a dirty brown if the temperature is raised. Delphinine is at first a brick-red, which turns to a reddish brown on heating.

The Composition and Solubility of Commercial Sulphate of Strychnine. M. W. Coleman. (*Amer. Journ. Pharm.*, 1883, 113.) The author's experiments indicate that strychnine sulphate of American manufacturers is distrychnine sulphate, having the formula $(C_{21}H_{22}N_2O_2)_2H_2SO_4 + 6H_2O$. It is soluble in from 42 to 43 parts of water at $15^\circ C$. It becomes anhydrous at $185^\circ C$., without fusion, losing from 12.099 to 12.5 per cent. of its weight, and is decomposed at a temperature of about $225^\circ C$.

Strychnine Sulphate. M. Lextrait. (*Journ. de Pharm. et de Chim.* [5], vi. 259-266.) The French Codex of 1866 orders the normal sulphate containing $7H_2O$, and corresponding with the formula determined by Regnault in 1838. The correctness of this formula was doubted by Schabus (1855), and subsequently Des Cloizeaux and Rammelsberg prepared hydrates of strychnine sulphate containing 5, 6, and $6\frac{1}{2}H_2O$. The author has recently examined numerous samples of the salt as it is met with in French commerce, and found that the normal and acid sulphates are used indiscriminately. He obtained the acid sulphate with $2H_2O$ in short needles, at an elevated temperature, and in thin needles, several centimeters long, when evaporated at a low temperature. Owing to its caustic properties it is not suited for medicinal use, more particularly not for subcutaneous injections.

The normal sulphate with $5H_2O$ is obtained from strychnine 10 parts, pure sulphuric acid 1.27 parts, and alcohol 50 parts, using a moderate heat for dissolving, the salt is soluble in 75 parts of alcohol. Using a somewhat diluted alcohol, large prismatic crystals are formed; but when the strength is reduced to below 50 per cent., the salt is mixed with the hydrate containing $6H_2O$, crystallizing in square plates. The latter is obtained by replacing the alcohol in the above directions with 35 parts of water, and crystallizing at $70^\circ C$; above this temperature a mixture of the two hydrates may be obtained. The author prefers for medicinal use the salt with $5H_2O$, because it is uniformly procured from the solution in strong alcohol.

Derivatives of Strychnine. M. Hanriot. (*Comptes Rendus*, February 26th, 1883.) The author has obtained a dinitro-strych-

nine by acting upon the base with an excess of strong nitric acid, keeping the mixture at -10° . On treating the hydrochlorate of dinitro-strychnine with sodium amalgam, he obtains diamido-strychnine, the properties and reactions of which are described.

Decomposition-Products of Strychnine. A. Goldschmidt. (*Ber. der deutsch. chem. Ges.*, xv. 1977.) The author announces that he has obtained indole from strychnine by fusion of the latter with potassium hydrate, and promises further communications on this subject.

Constitution of Atropine. A. Ladenburg. (*Liebig's Annalen*, ccxvii. 74-149. *Journ. Chem. Soc.*, 1883, 670.) In this paper the author has collected together the various facts on this subject, mostly already published and abstracted, and thus gives an historical sketch of this interesting research. When tropine had been recognised as a tertiary base, the author proceeded to synthesize atropine from its products of decomposition—tropine and tropic acid, which he succeeded in doing by the action of dilute hydrochloric acid on tropine tropate. This being accomplished, he next prepared various other alkaloids, called by him tropeines, by a similar method; thus, from tropine mandelate he obtained *homotropin* or *phenylglycolic tropeine*, and measurements of the crystals and the following additional observations are now given:—The *hydrochloride* crystallizes from concentrated neutral solutions after some time; it is very soluble in water; the *sulphate* can be crystallized from water, and forms needles with silky lustre; solutions of the hydrochloride give a white curdy precipitate with potassium mercuric iodide, a white oil with mercuric iodide, and a crystalline *platinochloride* with platinic chloride. From tropine atrolactate, *atrolactic tropeine* is obtained. Additional remarks:—This substance crystallizes in needles (m. p. $119-120^{\circ}$), very sparingly soluble in cold, but more readily in hot water, and easily in alcohol. It is isomeric with atropine, and its mydriatic action is equally remarkable. The hydrochloride, hydroiodide, hydrobromide, and sulphate, have not been obtained in crystals. The *platinochloride* forms reddish yellow crystals, very soluble in water and alcohol. The *aurochloride*, $C_{17}H_{23}NO_3 \cdot AuCl_4H$, crystallizes in yellow needles, which melt under water, but when dry melt at $112-114^{\circ}$, sparingly soluble in cold water. *Salicylic tropeine*, $C_{15}H_{19}NO_3$, is obtained from tropine salicylate; it does not act on the pupils of the eye; the platinochloride has the composition $(C_{15}H_{19}NO_3 \cdot HCl)_2PtCl_4$, the *aurochloride*, $C_{15}H_{19}NO_3 \cdot HCl \cdot AuCl_3$. *Hydroxybenzotropine* can be partially distilled without decomposing, whilst the remainder

is carbonised. It has a slightly alkaline reaction, and is soluble both in acids and in soda. It crystallizes without water of crystallization. It does not act on the eye as energetically as atropine. The *nitrate* is moderately soluble, and is coloured yellow when boiled with excess of nitric acid. Iodine gives rise to a crystalline mixture of tri- and pent-iodide. The mercurio- and stanno-chlorides have been obtained—the former in colourless leaflets, the latter in tufts of white needles. Other precipitates are formed with tannic acid, potassium mercuric iodide, potassium ferri- and ferrocyanide, and phosphomolybdic acid. The simple salts of parahydroxybenzotropeine, $C_{15}H_{19}NO_3$, are mostly soluble, the *nitrate* crystallizing in prisms only sparingly soluble; this salt is turned yellow by boiling with nitric acid. It gives precipitates with all the various reagents mentioned above; the *mercurochloride*,— $HgCl_2, C_{15}H_{19}NO_3, HCl, H_2O$, crystallizes in needles.

Benzotropeine, $C_{15}H_{19}NO_2$. Additional remarks :—It distils without leaving a residue. The *nitrate* is sparingly soluble, and is turned yellow by boiling with nitric acid. The aurochloride forms microscopic needles, slightly soluble in water, easily in alcohol. It gives precipitates with the usual reagents. *Phenylacetotropeine*, $C_{16}H_{21}NO_3$, the sulphate of this forms colourless needles. *Cinnamyl tropeine*, $C_{17}H_{21}NO_3$, can be prepared either from cinnamic acid, tropine, and hydrochloric acid, or by treating phenylacetic acid in a similar manner. It has scarcely any mydriatic action, but is a powerful poison. *Atropyltropeine* and *phthalyltropeine* are the last of the series of the compounds described in this paper. The author then passes on to his work on the constitution and synthesis of tropic acid, from the results of which he arrives at the constitution $CH_2(OH).CHPh.COOH$ for that acid. With regard to the constitution of tropine, the author finds that when it is heated with soda-lime, *methylamine* and a *hydrocarbon* like tropilidine, C_7H_8 , stand prominent amongst the products; so that the principal reaction may be represented by the equation $C_8H_{15}NO = NH_2.CH_3 + C_7H_8 + H_2O$. When tropine is decomposed with acids, it gives rise to *tropidine*; the best method for the preparation of this base is to heat a mixture of tropine (2 parts), glacial acetic (12 parts), and concentrated sulphuric acid (46 parts). In addition to the properties, etc., already given, the vapour density has been determined, and found to be 118. Tropidine is soluble in acids, in ether, and alcohol, scarcely soluble in soda; its aqueous solution has a strongly alkaline reaction. *Tropidine hydrochloride* forms hygroscopic crystals, soluble in water. The *hydrobromide* is similar, but not quite so

hygroscopic. The *picrate* crystallizes in yellow needles, very sparingly soluble in cold, somewhat more so in hot, water. The *periodide* forms brown prisms (m. p. 92–93°), soluble in alcohol. With methyl or ethyl iodide, tropidine yields a mono-methyl- or ethyl-derivative, which is crystalline and forms well-defined crystalline platino- and auro-chlorides. The action of hydriodic acid and phosphorus on tropine results in the formation of *hydrotropine iodide* (m. p. 115°); if, however, during the reaction the tube be heated to 150°, or above, tropidine and its periodide are the products, owing to a secondary dehydrating reaction resulting in the conversion of tropine into tropidine. The formation of *metatropine* from hydrotropine iodide is then discussed, and the conclusion arrived at is that tropine is a nitrogenous alcohol, of which the tropeines are the ethereal derivatives. This view is supported by the author's work on alkines, which are a class of bodies quite analogous to the tropeines. Then follow detailed accounts of the following experiments:—Decomposition of dimethyltropine by heat; the production of tropilene from methyltropidine iodide, and tropilidene from dimethyltropine iodide; the decomposition of methyltropine, methyltropine chloride and iodide by potash, the principal products being *di-* and *tri-methylamine*; the oxidation of tropilene into adipic acid, and finally the decomposition of tropidine by bromine, by which *ethylene dibromide* and *dibromomethylpyridine* are obtained. The inferences there deduced are enlarged upon, and the formula $C_5H_7(C_2H_4O.CO.CHPh.CH_2.OH)NMe$, proposed for atropine.

Tropine. G. Merling. (*Liebig's Annalen*, cccvi. 329–355.) The author supplements his previous report with a few additional observations. Tropic acid, $C_6H_{11}N(CO_2H)_2$, which is formed during the oxidation of tropine with potassium bichromate and sulphuric acid, separates from dilute alcohol in fine needles, which are readily soluble in water, but insoluble in alcohol and ether. He has examined the silver salt and the platinochloride. The distillation of the acid with lime has hitherto yielded him no feasible products.

Derivatives of Tropeine and Tropine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xv. 1025–1031.) By the action of nitric acid on tropine, *nitryltropeine*, of the probable constitution $C_8H_{14}N(ONO_2)$, is formed. The hydrochloride of this base may be obtained from the crude product of the reaction by saturating with potassium carbonate, extracting with ether, and then shaking up with dilute hydrochloric acid. With platinum and gold chlorides and with picric acid the solution of the hydrochloride gives crystal-

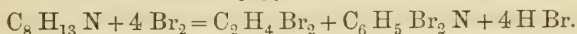
line, sparingly soluble precipitates. The free bases could not be obtained in a state sufficiently pure for analysis; but the author infers that the substance contains an ONO_2 group, from the fact that potassium nitrate is formed on boiling it with potash.

Phenylacetropine hydrochloride, $\text{C}_7\text{H}_{14}\text{NO}(\text{OC}_6\text{H}_7)\text{HCl}$, is formed by the slow action of dilute hydrochloric acid on tropine phenylacetate, but the free base could not be obtained in the pure state. The hydrobromide crystallizes in dull prisms, the sulphate in tables, the platinochloride in reddish prisms, the aurochloride in glistening leaflets.

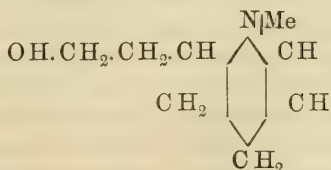
Atrolactyltropine or *Pseudotropine*, $\text{C}_8\text{H}_{14}\text{NO}(\text{C}_9\text{H}_9\text{O}_2)$, obtained by a method similar to phenylacetropine, is a crystalline substance (m. p. 121°); it forms a sparingly soluble monochloride and picrate. The midriatic action of pseudoatropine is analogous to that of atropine.

Tropilene yields on oxidation with concentrated nitric acid oxalic and normal adipic acid.

By the action of bromine on tropidine hydrobromide, ethylene dibromide, and dibromomethylpyridine are formed, thus:—



From these reactions some insight may be gained into the constitution of tropine and tropidine; the latter is a hydrogen addition product, and at the same time an ethylene-derivative of methylpyridine, whose dibromo-derivative is formed in the reaction above. Moreover, from the author's previous experiments it is probable that the methyl group is directly combined with the nitrogen-atom, so that tropidine may be represented by the formula $\text{C}_5\text{H}_6(\text{C}_2\text{H}_4)\text{NMe}$, and tropine by the formula $\text{C}_5\text{H}_7(\text{C}_2\text{H}_4(\text{OH}))\text{NH}_2$. As tropilene on oxidation gives normal adipic acid, the following structural formula for tropine may be considered probable:—



Decomposition of Tropidine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xv. 1140.) Tropidine hydrobromide, when treated with a large excess of bromine at 165°C ., yields a large quantity of dibromopyridine along with ethylene bromide, a result confirming the author's previous supposition that tropidine is ethylenehydro-

methypyridine. The dibromopyridine obtained in this reaction was proved to be identical with that prepared from piperidine.

Preparation of Crystallized Hyoscyamine. M. Duquesne. (*Chem. Cent. Blatt.*, xiii. 722; *Journ. Soc. Chem. Ind.*, 1883, 295.) Many methods of preparing crystallized hyoscyamine have been suggested, but on experiment they do not give satisfactory results, and the manufacturers are careful to keep their own processes secret. The author has thoroughly sifted the matter, and recommends the following method of preparing this alkaloid in the pure state. Finely-pounded fresh henbane seeds are digested with boiling alcohol, to which half a part of tartaric acid has been added for 1,000 parts of the substance. The alcoholic extract, after the greater part of the alcohol is distilled off, consists of two separate layers, the upper being a green oil equal in weight to one-third of the seeds employed. This oil is repeatedly shaken with dilute sulphuric acid, which dissolves the alkaloid, probably combined with a fatty acid, and the acid extract is nearly completely saturated with potassium bicarbonate, filtered, and evaporated on the steam-bath to a syrup. The cold residue is taken up with alcohol, which leaves the sulphate of potash behind, the alcohol is distilled off, the last traces are driven away on the steam-bath, the residue is dissolved in a little water, precipitated with a slight excess of potassium bicarbonate, and shaken up with chloroform, which dissolves the alkaloid. The chloroform extract is filtered, mixed with sulphuric acid in slight excess, the solution decolorized with washed animal charcoal, and evaporated at a gentle heat to a syrupy consistency. The sulphate obtained is mixed with dry precipitated carbonate of lime in excess, which after a considerable time converts the alkaloid into carbonate, and this changes finally into pure hyoscyamine. After an addition of fine sand, the mixture is dried at a gentle heat, or better over caustic lime or H_2SO_4 , then finely powdered, and exhausted thoroughly with chloroform. The chloroform is allowed to evaporate, at first by the aid of a very gentle heat, with the addition of rectified toluene, and finally spontaneously, so that the process may occupy a long while and the formation of distinct crystals be permitted. The hyoscyamine is ultimately obtained in the form of long, colourless and inodorous needles, stellated and grouped round a central point. Crystallized hyoscyamine dissolves in alcohol, ether, and especially in chloroform, with a strong alkaline reaction. It combines with acids, as with sulphuric acid, to neutral, crystallized, slightly soluble salts. With sulphuric acid and potassium bichromate, hyoscyamine produces

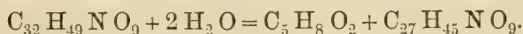
the same agreeable odour as atropine. The nitric acid reaction is also similar.

Studies relating to Veratrine. Dr. E. Bosetti. (*Chemiker Zeitung*, 1883, 360.) As the starting-point of his exhaustive research, the author selected the so-called official veratrine, which is said to be completely soluble in ether. The following results were obtained:—

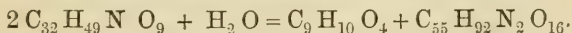
1. The pure official veratrine consists of a very homogeneous, externally amorphous mixture of two isomeric alkaloids, having the formula $C_{32}H_{49}NO_9$, of which the one is crystallizable and practically insoluble in water—crystallized veratrine (cevadine of Wright and Luff),—the other uncrystallizable, but soluble in water. The latter is called by the author *veratridine*; it is identical with the soluble veratrine of Weigelin and E. Schmidt. Relatively small amounts of the first-mentioned alkaloid suffice to render the latter insoluble in water, and on the other hand small amounts of the latter are sufficient to prevent the crystallization of the former.

2. By boiling with an alcoholic solution of barium hydrate, both of these alkaloids are split in the following manner:—

(a) Crystallized veratrine is decomposed into angelic acid and amorphous cevadine,—



(b) Veratridine is decomposed into veratric acid and amorphous veratronine, according to the equation,—



The cevadine, $C_{27}H_{45}NO_9$, forms a yellowish white powder, having an alkaline reaction and peculiar sweetish taste. Veratronine forms after drying and trituration a yellowish white powder, the dust of which incites violent sneezing and coughing. It is sparingly soluble in water, but readily soluble in chloroform, ether, amylic alcohol, benzol, and carbon bisulphide.

Colchicine and Colchiceine. S. Zeisel. (*Monatsh. Chem.*, iv. 162-164.) By the action of hydrochloric or sulphuric acid on a very dilute solution of colchicine, it is known that in addition to colchiceine, another base is formed in small quantity. By heating colchiceine with strong hydrochloric acid at 110-120°, it is completely converted into the new base (termed *apocolchiceine* by the author) and methyl chloride. Apocolchiceine is obtained as an amorphous flocculent yellow precipitate on adding sodium carbonate to its solution in acids; it is sparingly soluble in cold, more readily

in hot, water; the hot aqueous or dilute alcoholic solutions solidify on cooling to a gelatinous mass. It is readily soluble in caustic alkalies or acids, the solutions in the latter being of an intense yellow colour, and leaving yellow varnishes on evaporation; contrary to the statement of Hertel, the hydrochloride does not lose hydrochloric acid by repeated evaporation to dryness. On addition of powdered potassium nitrate to a solution of apocolchiceine in concentrated sulphuric acid, the yellow colour changes to indigo, then to violet, finally to reddish yellow, addition of alkali causing a fine red coloration. Apocolchiceine hydrochloride gives amorphous precipitates with picric acid, potassium iodide, bromine-water, potassium bismuth iodide, phosphotungstic acid, and phosphomolybdic acid; with ferric chloride it gives a brownish green precipitate dissolving in hydrochloric acid to a green solution.

Salts of Caffeine. C. Tanret. (*Journ. de Pharm. et de Chim.* [5], v. 591-595.) The author endeavours to show that caffeine does not form salts with the organic acids, and that its so-called combinations with the latter have no real existence. Acetic, valerianic, lactic, and citric acids dissolve it, but on cooling the solution pure caffeine separates out. The acids used for dissolving it remain free in the solution, as caffeine—owing to its extremely weak basic properties—is incapable of neutralizing the smallest trace of acid. While citric acid, which is tribasic, requires for the formation of citrates three equivalents of base, one or two of which can be replaced by one or two equivalents of water, there is required to effect the solution of one equivalent of caffeine in water a quantity of acid represented in weight by about three equivalents of acid. With mineral acids, however, caffeine does form salts, the sulphate being crystallized with difficulty, whilst the hydrochloride and hydrobromide crystallize well. They are, however, decomposed by water into caffeine, which is precipitated, and the free acid; the hydrochloride decomposes even on exposure to the air. Such compounds, as well as its solutions in organic acids, are useless for hypodermic injections.

With benzoate, cinnamate, salicylate, acetate, lactate, and citrate of sodium caffeine forms readily soluble double salts, which may be prepared by treating the alkaloid with its equivalent of the sodium salt dissolved in a small quantity of water. By means of these combinations caffeine can be used for subcutaneous injections.

Combinations of Caffeine with Organic Acids. Dr. H. Biedermann. (*Archiv der Pharm.*, April, 1883.) C. Tanret's allegation of the non-existence of organic salts of caffeine (see preceding

abstract), being contradictory of the results of Prof. Schmidt, the author, at the request of the latter, has re-investigated this subject. His report contains descriptions and analyses of a number of definite salts of caffeine, including the formate, acetate, butyrate, and valerianate, as well as the hydrochlorate, hydrobromate, nitrate, sulphate, aurochloride and platinochloride. According to Prof. Schmidt, the salts may, as a rule, be obtained by dissolving the caffeine, with a moderate amount of heat, in the respective concentrated acids; upon cooling, the salts usually crystallize out, but if not, crystals of the salts may be obtained by keeping the solutions over chloride of calcium. It is admitted, however, that these salts are all very unstable, splitting up when brought into contact with water or alcohol, and that they are therefore quite unsuited for medicinal use.

Caffeine, Theobromine, Xanthine, and Guanine. E. Fischer. (*Liebig's Annalen*, ccxv. 253-320; *Journ. Chem. Soc.*, 1883, 354.)

Derivatives of Caffeine.—*Chlorocaffeine*, $C_8H_9N_4O_2Cl$, first obtained by Rochleder, is best prepared by the action of dry chlorine on powdered caffeine, the reaction being assisted towards its close by heating to $75-80^\circ$; it can also be prepared by the action of phosphoric pentachloride on caffeine. It forms white crystals, melting at 188° , sparingly soluble in cold water and ether, more readily in boiling water and hot alcohol. It is reconverted into caffeine by the action of nascent hydrogen.

Bromocaffeine, when heated with alcoholic ammonia for six to eight hours at 130° , is converted into *amidocaffeine*, $C_8H_9N_4O_2.NH_2$; this crystallizes in slender needles, melts at above 360° , and can be sublimed. It is sparingly soluble in water and alcohol, more readily in hot acetic acid. Notwithstanding the entry of the amido-group, it has less basic power than caffeine. It is also formed in small quantity by the action of potassium cyanide in dilute alcoholic solution on bromocaffeine. Bromocaffeine, when boiled with aqueous potash, does not yield hydroxycaffeine; with alcoholic potash it yields *ethoxycaffeine*, $C_8H_9N_4O_2.OEt$, crystallizing in colourless needles, which melt at 140° and distil at a higher temperature with but little decomposition. It has feeble basic properties. If heated with hydrochloric acid, it is resolved into ethyl chloride and *hydroxycaffeine*; this melts at above 345° , and sublimes in considerable quantity at the same temperature. It yields unstable salts with bases. The *sodium salt*, $C_8H_9N_4O_3Na + 3H_2O$, crystallizes in slender interlaced needles. The *barium salt*, $(C_8H_9N_4O_3)_2Ba + 3H_2O$, forms groups of very fine prisms; both salts are very soluble

in water. The *silver salt* is obtained in slender needles by mixing ammoniacal solutions of hydroxycaffeine and a silver salt, and boiling to expel ammonia; it is insoluble in water; by heating it with ethyl iodide it is converted into ethoxycaffeine. Hydroxycaffeine, when heated with phosphorus pentachloride and oxychloride, is converted into chlorocaffeine. Oxidizing agents react readily with hydroxycaffeine; concentrated nitric acid destroys it even in the cold; chlorine or bromine, according to circumstances, gives either dimethyl-alloxan with small quantities of apocaffeine, or in concentrated hydrochloric solution in the cold, yields no alloxan, but a mixture of apo- and hypo-caffeine; in both cases an additive-compound of the halogen and hydroxycaffeine seems to be first formed, and then decomposed by the water present. A compound of this kind is obtained by the action of bromine on dry caffeine, but it is too unstable to purify. As, however, it yields diethoxyhydroxycaffeine when treated with alcohol, it would appear to be a dibromide, $C_8H_9N_4O_2(OH)Br_2$.

Diethoxyhydroxycaffeine, $C_8H_9N_4O_2(OH)(OEt)_2$, is best prepared by the action of bromine on an alcoholic solution of hydroxycaffeine, cooled by a freezing mixture of ice and salt; the yield is nearly quantitative. It crystallizes in triclinic prisms, showing combinations of $\infty \bar{P}\infty$, $\infty \bar{P}\infty$, $OP\infty P'$, and $P\infty$, mostly developed in tables parallel to $\infty \bar{P}\infty$; the properties of this substance and of the corresponding methoxy-compound, have been already described.

Allocaffeine, $C_8H_9N_3O_5$, is obtained as a bye-product in the preparation of diethoxyhydroxycaffeine; it forms a sandy powder, melts at 198° , is nearly insoluble in water, and sparingly soluble even in boiling alcohol; it is slowly dissolved by boiling with concentrated hydrochloric acid, and on evaporation is decomposed into readily soluble products.

Apocaffeine, $C_7H_7N_3O_5$, is formed, together with hypocaffeine, by the action of hot hydrochloric acid on diethoxycaffeine. It crystallizes in monoclinic prisms, having the axial relations $a:b:c = 0.8025:1:0.6976$; melts at $147-148^\circ$, and is decomposed on further heating; it is readily soluble in hot water, alcohol, and chloroform, sparingly soluble in cold water, benzene, and carbon bisulphide.

Caffuric Acid, $C_6H_9N_3O_4$, is obtained, together with carbonic anhydride, by boiling apocaffeine with water; the statement that hypocaffeine is formed at the same time is found to be erroneous, and was due to the presence of hypocaffeine in the apocaffeine employed. By the action of hydriodic acid, caffuric acid is converted into *hydrocaffuric acid*, $C_6H_9N_3O_3$, crystallizing in colour-

less prisms melting between 240° and 248° , and resolidifying at 235° ; it is readily soluble in hot water. On boiling it with baryta-water, methylamine is formed, together with the barium salt of an acid (methylhydantoincarboxylic acid?), stable in alkaline solution but yielding methylhydantoin when the barium is precipitated by carbonic anhydride.

Hypocaffeine, $C_6H_7N_3O_3$ (m. p. 182°), is not derived from the decomposition of apocaffeine, as previously stated, but is formed at the same time, and apparently independently of the latter, in the decomposition of diethoxyhydroxycaffeine by hydrochloric acid. It can be distilled in great part unchanged, and is readily soluble in hot water and alcohol, sparingly in cold water. The barium salt $(C_6H_6N_3O_3)_2Ba$, crystallizes in slender white needles, the silver salt, $C_6H_3N_3O_3Ag$, or $C_{18}H_{19}N_9O_9Ag_3$, in aggregates of plates. On boiling it with baryta-water, hypocaffeine is converted into caffoline.

When caffoline is boiled with acetic anhydride, carbonic anhydride and *acetylaccaffeine*, $C_6H_{10}N_3O_2Ac$, are formed; this crystallizes in monoclinic forms, showing the combinations $\infty P \infty$, OP , ∞P , $P \infty$, $\frac{2}{3}P \infty$. It melts at $106-107^{\circ}$, is readily soluble in water, alcohol, chloroform, and benzine, sparingly in ether. On treatment with hydrochloric acid, *acecaffeine hydrochloride* is obtained as a crystalline mass, readily soluble in water, and yielding the free base on treatment with silver oxide.

Accaffeine, $C_6H_{11}N_3O_2$, crystallizes in prismatic or tabular forms of the rhombic system, having the axial relations $a : b : c = 0.6707 : 1 : 1.2245$, and showing the combination ∞P , OP , $\dot{P} \infty$, and, less frequently, $\infty \dot{P} \infty$. It melts at $110-112^{\circ}$, distils without decomposition, and is readily soluble in water and alcohol. On oxidation with chromic acid, it yields a substance closely resembling cholestropane. By the action of chlorine a chloro-derivative is obtained, crystallizing in colourless needles. When heated with baryta-water, ammonia, methylamine, dimethylcarbamide are formed.

Theobromine.—By the action of chlorine on theobromine, monomethylalloxan and methylcarbamide are obtained. *Bromotheobromine*, $C_7H_7N_4O_2Br$, is prepared in a manner similar to bromocaffeine, and forms a white crystalline powder, sparingly soluble in hot water, nearly insoluble in the cold; like theobromine, it possesses acid properties, and dissolves readily in aqueous solutions of alkalies, but only sparingly in ammonia. The potassium salt is nearly insoluble in alcohol, and does not yield an ethoxy-compound on long boiling with alcoholic potash. The silver salt is obtained

as a crystalline precipitate by mixing ammoniacal solutions of bromotheobromine and silver nitrate. On heating this silver salt with ethyl iodide, *bromethyltheobromine* is obtained; it closely resembles bromocaffeine. By the action of alcoholic potash, it yields *ethoxyethyltheobromine*, crystallizing in needles (m. p. 155°), *Hydroxyethyltheobromine*, $C_7H_6EtN_2O_4 \cdot OH$, is obtained on boiling the ethoxy-compound with hydrochloric acid; it closely resembles hydroxycaffeine in appearance; treated with bromine and alcohol it is converted into *diethoxyhydroxyethyltheobromine* (m. p. 152°), which is much more readily soluble in alcohol than the corresponding caffeine-compound, and is decomposed by evaporation with hydrochloric acid into methylamine and *apoethyltheobromine*. This last, on being boiled with water, gives a substance which, by its behaviour with basic lead acetate, is undoubtedly a homologue of caffuric acid.

Hypoethyltheobromine, $C_7H_9N_3O_3$, is obtained, together with the apo-compound, by the action of chlorine on a solution of hydroxyethyltheobromine cooled to -10° . It forms colourless crystals melting at 142° , and closely resembles hypocaffeine; it is sparingly soluble in cold, readily in hot water, and can be distilled unchanged. The author considers that these results show that the same methylamine group is split off in the formation of apo- and hypo-compounds, from both caffeine and theobromine.

Xanthine.—From the resemblance which xanthine bears to caffeine and theobromine, Strecker (*Annalen*, cxviii. 72), considered that the three bases formed a homologous series, but was unsuccessful in his attempts to methylate xanthine.

Xanthine is best prepared from guanine as follows:—10 drops of guanine are dissolved in a mixture of 20 grams concentrated sulphuric acid, and 150 grams water, heated to boiling, and after cooling to $70-80^\circ$, a solution of 8 grams of sodium nitrate is added, the mixture being well stirred. The yield is nearly quantitative, the xanthine is only of a pale orange colour, and is free from Strecker's nitro-body.

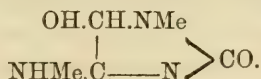
By the action of hydrochloric acid and potassic chlorate, xanthine is converted into alloxan and urea.

On heating the lead salt of xanthine with $1\frac{1}{4}$ times its weight of methyl iodide in closed tubes for twelve hours at 100° , a yellow mass is obtained, from which, by boiling with water, treatment with hydrogen sulphide, and evaporation with ammonia, a crystalline powder is obtained, possessing all the properties of *theobromine*. To remove all doubt as to its identity with natural theobromine, it was

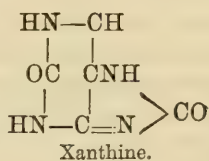
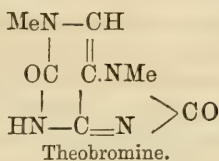
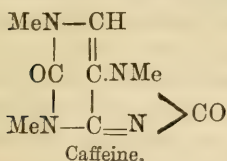
converted into caffeine by Strecker's method; the melting-point of the sample so prepared agreed perfectly with that of natural caffeine.

Constitution of Caffeine and its Derivatives.—The following are the principal facts to be considered in assigning a formula to caffeine:—(1) Its decomposition by chlorine into dimethylalloxan and monomethylcarbamide. (2) The presence of a single hydrogen atom other than those contained in the three methyl groups, and capable of replacement by chlorine, bromine, or the amido or hydroxyl groups. (3) The direct union with a molecule of bromine, showing a double carbon linking. (4) The conversion of caffeine—by addition of oxygen and successive elimination of methylamine and carbonic anhydride—into caffuric acid, a substance easily resolved into mesoxalic acid, methylamine, and methylcarbamide. (5) The ready formation of methylhydantoin from hydrocaffuric acid, showing

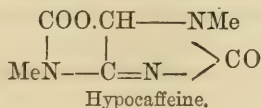
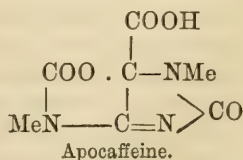
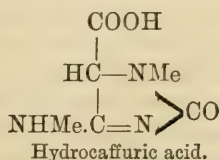
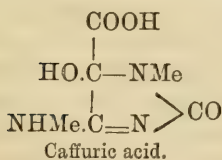
the presence in the latter of the group $\begin{array}{c} \text{C.NMe} \\ | \\ \text{C.N} \end{array} > \text{CO}$. (6) It has already been shown that caffoline has the constitution



From these considerations caffeine and its homologues are best represented by the formulæ—



The following formulæ are assigned by the author to the more important caffeine-derivatives:—



Occurrence of Caffeine in Cocoa. Dr. E. Schmidt. (*Liebig's Annalen*, ccxvii. 306.) During the extraction of theobromine from cocoa, the author has observed the last mother-liquors to contain caffeine, which can be freed from theobromine by dissolving in cold benzol and re-crystallizing from water.

Action of Hydrochloric Acid on Xanthine. Dr. E. Schmidt. (*Annalen*, ccxvii. 308.) Xanthine, like caffeine and theobromine, is decomposed when heated with hydrochloric acid to 200° C.; but in the place of methylamine, it yields ammonia besides carbonic and formic acids and glyccoll.

A Test for the Purity of Quinine. C. H. Wood and E. L. Barret. (*Chemical News*, xlvi. 4-6.) The following is the mode of operating recommended:—7 decigrammes of the quinine sulphate to be tested are put into a large test-tube and dissolved in 20 drops of diluted hydrochloric acid and 7 c.c. of water; 7 c.c. of benzine are then added, and the tube placed in warm water, so as to heat the benzine layer to about 60° or 70° C.; 3½ c.c. of diluted ammonia are then poured in, and the tube well shaken for about twenty seconds. The two liquids are allowed to separate from each other, and the lower layer is removed by a glass syphon filled with water. The tube containing the benzene solution is left at rest for about half an hour, or until the quinine hydrate has crystallized out, when the benzene is poured off through a little dry filter into a small *dry* test-tube (4 in. × ½ in.), and again left to crystallize. A few rhombic crystals of the quinine hydrate may occasionally again form, but these are to be disregarded. If the quinine sulphate contained 5 per cent. of cinchonidine, within half an hour several feathery groups of delicate needles will begin to appear in the liquid, and these will increase so that after an hour or so they are abundant throughout the tube. With 2 per cent. of cinchonidine the formation of these crystals takes a longer time, but is generally quite distinct after two or three hours; and with 1 per cent. a few small groups can usually be found by a pocket-lens after three or four hours, and in twelve hours are quite visible. Smaller proportions of cinchonidine than even this are revealed after some days, as the benzene slowly evaporates. When the quinine has been rigidly pure, the authors have never found a trace of acicular crystals in the liquid, even after many days, when the benzene has almost all gone. It is to be noted that the crystals should be looked for *within the liquid*, as the residue left on the upper part of the tube by the evaporation may give an erroneous impression.

Peculiar Behaviour of Quinine Hydrochlorate towards Silver Nitrate. Dr. G. Vulpius. (*Ann. Pharm.* [3], xx. 361.) If a weak solution of silver nitrate be slowly added to a likewise weak solution of quinine hydrochlorate, no precipitation of silver chloride takes place, owing probably to the formation of a soluble double chloride. With an excess of silver nitrate a precipitate is formed. The hydrochlorates of some other alkaloids seem to show a similar behaviour.

Quinine Tannate. J. Fiebert. (*Pharm. Centralhalle*, Nov. 16th, 1882.) A tasteless and in every respect satisfactory preparation is obtained as follows:—20 parts of quinine sulphate are mixed with about 4 parts of distilled water, to which 20 parts of dilute sulphuric acid are added to effect the complete solution of the quinine sulphate. When the latter is entirely dissolved, the whole is diluted with distilled water to make up 1,000 parts, filtered, and treated, under constant stirring, with 40 parts of a previously-prepared solution of sodium carbonate dissolved in 4 parts of water.

The precipitate thereby obtained (quinine hydrate) is collected on a paper filter, well washed with cold distilled water, and, while still moist, dissolved in 200 parts of alcohol of 96 per cent. This solution is filtered and gradually dropped, stirring the while, into a clear solution of tannic acid, prepared by digesting 60 parts of tannic acid with 1,000 parts of distilled water in the cold.

The whole is allowed to stand for a few hours to settle, and the white precipitate of quinine tannate is collected on a filter previously moistened with distilled water, and washed with distilled water at a temperature of 30° C., until the washings lose all astringent taste. The salt is then dried on bibulous paper, placed on a hair or wooden sieve, at a temperature not exceeding 30° C.

Twenty parts of quinine sulphate yield from 60 to 65 parts of tannate.

The employment of iron instruments or vessels must be avoided.

Cinchonidine. H. Weidel and K. Hazara. (*Monatsh. Chem.*, iii. 770-788; *Journ. Chem. Soc.*, 1883, 222.) Cinchonine oxidized with chromic acid yields, as chief products, cinchoninic acid and an acid brownish syrup, together with small quantities of carbonic and formic acids.

The syrupy liquid, freed from cinchoninic acid and other substances by a series of processes for which the original paper must be consulted, dried up in the exsiccator to a soft gummy mass, which showed no tendency to crystallize, even after standing for a year. Its aqueous solution decomposes carbonates at a boiling heat,

yielding deliquescent uncrystallizable salts. When neutralized with an alkali, it does not precipitate metallic salts. Heated with oxidizing agents, it does not yield either cinchoninic or pyridine-tricarboxylic acid, whence the authors infer that the syrupy liquid obtained by the oxidation of cinchonine does not contain any portion of that half of the cinchonine molecule which yields cinchoninic acid.

The syrupy liquid treated for a day with nitric acid yielded a small quantity of *nitrohydroxyquinoline*, $C_9H_5(NO_2)(OH)N$, a compound which unites both with bases and with acids, the salts of which it forms with the latter being very unstable. Its platinum-chloride, $(C_9H_5N_2O_3, HCl)_2PtCl_4$, forms monoclinic crystals, in which $a : b : c = 0.9705 : 1 : 0.8806$; $\beta = 96^\circ 20' 4''$. Optic axes nearly perpendicular to the base. Observed faces ∞P_∞ , OP , ∞P , $+P$, and $-P$.

When the residue left on evaporating the syrup over the water-bath is distilled with zinc-dust, a light-yellow oil passes over, and afterwards a brown viscid distillate, containing—together with ammonium carbonate, pyrroline, and bodies related thereto—the three following bases:—

Pyridine, C_5H_5N	Ethyl-pyridine, C_7H_9N	Quinoline, C_9H_7N
(b. p. 120°).	(b. p. $161\text{--}164^\circ$).	(b. p. $233\text{--}237^\circ$).

These bases are formed from that half of the cinchonine-molecule which is converted by oxidation into the syrupy product, and their formation shows that cinchonine must contain two hydrogenised quinoline-nuclei—a conclusion strengthened by the fact that tetrahydrocinchoninic acid, as shown by Weidel, yields by oxidation, not cinchoninic acid, but a syrupy mass, which as the authors find by preliminary experiments, also yields by distillation over zinc-dust, bases of the pyridine series, respecting which they promise a further communication.

Hydrocinchonidine. Dr. O. Hesse. (*Liebig's Annalen*, cxiv. 1–17; *Journ. Chem. Soc.*, 1883, 97.) Hydrocinchonidine, $C_{19}H_{24}N_2O$, is contained in considerable quantities in the aqueous mother-liquor from the preparation of homocinchonidine sulphate. The alkaloids are precipitated from this solution by ammonia and recrystallized from alcohol. The crystalline mass is dissolved in hydrochloric acid, and by fractional precipitation with sodium tartrate the homocinchonidine is separated from the hydrocinchonidine tartrate; the latter is contained in the last precipitate. The tartrate is converted into the neutral chloride: this is purified by recrystal-

lization from water, and then decomposed by ammonia, when it yields pure hydrocinchonidine. The pure alkaloid melts at 230° (uncorr.), and does not decolorize potassium permanganate immediately. The sulphuric acid solution is not fluorescent. Hydrocinchonidine is deposited from an alcoholic solution in six-sided plates or prisms, which are insoluble in boiling chloroform and but sparingly soluble in ether or in water. It is scarcely attacked by strong hydrochloric acid at 160° . The following salts were prepared : — $C_{19}H_{24}N_2O$, $HCl + 2H_2O$, short six-sided prisms, soluble in water and in alcohol ; $(C_{19}H_{24}N_2O)_2$, $H_2PtCl_6 + 3H_2O$, yellow amorphous precipitate ; $C_{19}H_{24}N_2O$, H_2PtCl_6 , orange-coloured six-sided plates. The *thiocyanate* and the *neutral oxalate* form anhydrous needles. The *salicylate* does not crystallize. The *quinat*e crystallizes in anhydrous needles soluble in water. The *tartrate*, $(C_{19}H_{24}N_2O)_2 \cdot C_4H_6O_6 + 2H_2O$, is sparingly soluble in cold water. The crystals of the *thiosulphate*, containing 1 mol. H_2O , dissolve in 117 parts of water at 10° . $C_{19}H_{24}N_2O$, $H_2SO_4 + 4H_2O$ is deposited in lustrous prisms sparingly soluble in cold water. $(C_{19}H_{24}N_2O)_2$, $H_2SO_4 + 7H_2O$ dissolves freely in alcohol and hot water. At 10° 1 part of the sulphate requires 57 parts of water for solution. The *phenol sulphate*, $(C_{19}H_{24}N_2O)_2SO_3$, $C_6H_6O + 5H_2O$, forms white prisms sparingly soluble in cold water. The *acetic derivative*, $C_{19}H_{23}AcN_2O$, is a hygroscopic amorphous powder, soluble in alcohol, ether, acetone, and chloroform.

Amorphous hydrocinchonidine is formed when the acid sulphate of this base is heated at 160° with hydrochloric acid, and is precipitated in the form of a resin on the addition of soda to the aqueous solution of the crude product. The pure base melts below 100° . It is easily soluble in ether, alcohol, chloroform, and acids. Hydrocinchonidine deviates the ray of polarised light to the left much more powerfully in an acid than in a neutral solution.

Hydroconquinine and Conquinine. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xv. 3008–3011.) *Hydroconquinine sulphate*, $(C_{20}H_{26}N_2O)_2H_2SO_4$, is deposited on evaporating its aqueous solution at 30 – 50° in slender needles containing 2 mols. H_2O . 92.3 parts of water at 16° dissolve one part of this salt. On exposing a solution saturated at 20° to a temperature of 10° , the sulphate is deposited in thick monoclinic prisms or rhombic plates, containing 8 mols. H_2O . One part of this salt dissolves in 81.1 parts of water at 16° .

Conquinine may be easily separated from hydroconquinine by recrystallizing the neutral hydrochloride or acid sulphate from water or alcohol.

Identity of Hydroconquinine with Hydroquinidine. C. Forst and C. Böhringer. (*Ber. der deutsch. chem. Ges.*, xv. 1306.) The authors point out that Hesse's *hydroconquinine* is identical with the alkaloid, *hydroquinidine*, obtained by them by the action of potassium permanganate on quinidine sulphate (see abstr., *Year-Book of Pharmacy*, 1882, 62).

They also describe the hydrochlorate, hydriodate, neutral and acid tartrate, benzoate, salicylate, oxalate, thiocyanate, and the neutral and acid sulphates of this base.

Quitenidine. C. Forst and C. Bohringer. (*Ber. der deutsch. chem. Ges.*, xv. 1659-1661; *Journ. Chem. Soc.*, 1882, 1307.) In the preparation of hydroquinidine by the action of potassium permanganate on quinidine, the solution from which the hydroquinidine has been precipitated by an alkali, contains quitenidine, $C_{19}H_{22}N_2O_4$. The alkaline liquid is neutralized with dilute sulphuric acid, and rapidly evaporated. The alkaloid is deposited in white crystals; a further yield of the alkaloid is obtained by evaporating the mother-liquor nearly to dryness, and exhausting the residue with alcohol. After recrystallizing the crude product from a mixture of alcohol (1 part), and water (3 parts), the alkaloid is obtained in fragile plates containing 2 mols. H_2O . The crystals melt at 240° , and decompose at 246° . They are soluble in hot water, alkalies, and acids. The fluorescence of the sulphuric acid solution is destroyed by the addition of hydrochloric acid. With chlorine-water and a drop of ammonia, the aqueous solution gives a green coloration, which changes to dark-violet on the addition of potassium ferrocyanide. Silver nitrate and tannic acid produce white precipitates. Phosphotungstic and phosphomolybdic acid yield pale-coloured precipitates, soluble in ammonia. The *sulphate*, $C_{19}H_{22}N_2O_4 \cdot H_2SO_4 + 3H_2O$, forms white prisms; the *platinochloride*, $C_{19}H_{22}N_2O_4 \cdot H_2PtCl_6 + 3H_2O$, crystallizes in large needles of an orange colour.

Quinovin and Quinovic Acid. C. Liebermann and F. Giesel. (*Ber. der deutsch. chem. Ges.*, April 23, 1883; *Chem. and Drugg.*, June, 1883.) Although the waste products of the manufacture of quinine contain considerable quantities of quinovin and quinovic acid, these substances have been but little investigated.

Operating upon large quantities of such by-product, the authors have of late prepared both quinovin and quinovic acid in a pure state.

The authors find that the quinovine obtained from cuprea bark is somewhat different to that yielded by cinchona, and term the latter α , and the former β , quinovin.

α Quinovin is a white light crystalline powder, quite insoluble in cold, and but sparingly soluble in hot, water. It is also very difficultly soluble in benzole, chloroform, and absolute ether. It is, however, soluble in alcohol, both strong and dilute, crystallizing from the former, on the addition of water, in rosettes of minute needles, and from the latter in shining scales. It is further soluble in aqueous solutions of the alkalies, and in lime and baryta water. α Quinovin dissolves in concentrated sulphuric acid to an orange-yellow colour, with formation of carbonic oxide.

β Quinovin is very similar to α , but differs from it in being perfectly insoluble in absolute ether, and crystallizes out from very strong alcohol without the addition of water.

Quinovic acid is a snow-white powder consisting of minute needles. It is entirely insoluble in water, and but very slightly soluble even in boiling alcohol or glacial acetic acid. It is, however, soluble in ammonia and in solutions of the alkalies and alkaline earths. The quinovates of ammonium and calcium crystallize from their solutions in alcohol in needles; the former salt loses its ammonia on exposure to the air, or upon boiling its alkaline solution. Quinovic acid decomposes the carbonates of the alkalies, forming quinovates of the bases.

The formula for quinovin is probably $C_{39}H_{63}O_{11}$, and for quinovic acid, $C_{33}H_{48}O_6$; but the authors have not come to a definite conclusion, and are continuing their researches.

Cinchocerotin. A. Helms. (*Archiv der Pharm.*, ccxxi. 279–283. *Amer. Journ. Pharm.*, 1883, 357.) Under the name of *cinchocerotin*, Kerner exhibited at the world's exposition in Paris and London, in 1859 and 1862, a constituent of the cinchona barks which had been discovered by him. With regard to the method of preparation of cinchocerotin, Dr. Kerner has communicated the following to Prof. Flückiger:—

“Flat South American calisaya bark was dried with milk of lime, extracted by boiling alcohol, and the liquid cooled. The cooling of the liquid was effected in copper tubes, through which the solution was slowly conducted. After from six to nine months the tubes were incrustated with crude cinchocerotin.”

The crude cinchocerotin is a brown mass, from which two different constituents may be prepared, viz.: a crystalline white body, readily soluble in alcohol; and, in much smaller amount, a whitish yellow substance, sparingly soluble in alcohol. The latter is likewise sparingly soluble in ether, chloroform, benzol, and the more volatile portions of petroleum; but, on the contrary, is more readily soluble

in boiling amylic alcohol and xylol, from which solutions it separates in an amorphous form on cooling. It is decomposed at $230^{\circ}\text{C}.$, without melting, and forms by heating with glacial acetic acid a white, crystalline acid which melts at $54^{\circ}\text{C}.$, and is readily soluble in alcohol, ether, and petroleum (b. p. $60^{\circ}\text{C}.$). This acid forms sparingly soluble barium, lead, and calcium salts, and soluble salts with the alkalies. Further experiments could not be made, as only a small amount of material was at hand, and by the present method of conducting the quinine factories the cinchocerotin is no longer obtained.

The first mentioned crystallizable substance, for which the name cinchocerotin may be retained, forms white, very light, crystalline scales, which, when heated upon platinum foil, burns without any remarkable odour. The melting point is at $130^{\circ}\text{C}.$; when more strongly heated, it partially sublimes with decomposition; if, however, carefully heated in a current of carbonic acid, it sublimes without decomposition. It dissolves readily in ether, chloroform, and alcohol, but does not dissolve by boiling with water, hydrochloric, dilute sulphuric, and glacial acetic acids. By boiling with a solution of carbonate of sodium or caustic soda it is not attacked, and also not by alcoholic soda; with concentrated sulphuric acid it gives a reddish brown solution. By the action of nitric acid it is converted into a yellow resinous-like body; and by the action of bromine a brown, uncrystallizable substance was obtained. When melted with potassium hydrate, cinchocerotin becomes yellow, but does not mix therewith, and when more strongly heated it volatilizes partially, with decomposition.

The analysis of cinchocerotin afforded numbers corresponding to the formula $\text{C}_{27}\text{H}_{48}\text{O}_2$. By oxidation with potassium bichromate and sulphuric acid, a green liquid and a green precipitate were obtained. In the liquid, by distillation, acetic and butyric acids were detected; from the green precipitate by solution in caustic soda and supersaturation with an acid, a yellow precipitate was obtained, which, when washed, and dissolved in alcohol, had an acid reaction, and afforded upon the evaporation of the solution small, wart-like crystals, which may be designated as *cinchocerotinic acid*. After recrystallization the acid melted at $72^{\circ}\text{C}.$, and afforded, upon analysis, numbers corresponding to the empirical formula, $\text{C}_{10}\text{H}_{22}\text{O}_2$.

From the above results it is manifest that cinchocerotin is not a wax or a fat, and undoubtedly possesses a very high molecular weight. To conclude, from its properties and its occurrence, the

author believes it capable of being classified with betulin and cerin.

Synthesis in the Quinoline Series. Z. H. Skraup. (*Monatsh. Chem.*, viii. 381-385, and *Journ. Chem. Soc.*, 1882, 1216.) The preparation and properties of ortho- and paratoluquinoline have already been described (see *Year-Book of Pharmacy*, 1882, 67). Metatoluquinoline has now been prepared by the same method from metatoluidine (42 grams), metanitrotoluene (27 grams), glycerol (100 grams), and sulphuric acid (90 grams). It is a pale, yellow, strongly refracting liquid, boiling at 259.7° (corr.) under 747 mm. pressure; sp. gr. at $0^{\circ} = 1.0839$, at $20^{\circ} = 1.0722$, at $50^{\circ} = 1.0576$. It does not solidify at -20° ; its solution in dilute sulphuric acid shows a blue fluorescence. Its odour and other properties are very similar to those of orthotoluquinoline. The *platinochloride*, $(C_{10}H_9N, HCl)_2$, $PtCl_4 + 2H_2O$, forms brilliant orange-yellow prisms, very sparingly soluble in cold, more so in boiling water, but the best solvent is boiling dilute hydrochloric acid. The *hydrochloride* crystallizes with difficulty in thin white needles or large clear prisms, which are hygroscopic, soon become dull in the air, and carmine red on exposure to light. *Sulphates*.—One crystallizes from dilute alcohol in white prisms, insoluble in absolute alcohol, easily soluble in 60 per cent. alcohol; it is not a pure salt. Another, $(C_{10}H_9N)_2(H_2SO_4)_3$, forms small thin deliquescent needles soluble in alcohol, containing very little water. The *picrate* forms deep yellow microscopic prisms, melting at $206-207^{\circ}$ (uncorr.), almost insoluble in benzene and alcohol. The *methiodide*, $C_{10}H_9N_7MeI + \frac{1}{2}H_2O$, crystallizes in long brittle yellow needles, almost insoluble in ether, sparingly in absolute, more easily in dilute, alcohol, and most soluble in water; the alcoholic solution is yellow, the aqueous colourless. On adding alkali to the aqueous solution an oil separates out, and on boiling the usual quinoline odour is observed. In the following table the boiling points and specific gravities of the three known toluquinolines are compared:—

Toluquinoline.	B. p. corr.	Bar.	Sp. gr.		
			0°	20°	50°
From [1 : 2] toluidine .	247.3-248.3	751.3 mm.	1.0852	1.0734	1.0586
From [1 : 3] toluidine .	259.7°	747.0 "	1.0839	1.0722	1.0576
From [1 : 4] toluidine .	257.4-258.6	745.0 "	1.0815	1.0681	1.0560

The Quinoline of Coal-Tar and of the Cinchona Alkaloids, and its Oxidation by Potassium Permanganate. S. Hoogewerff and W. A. v. Dorp. (*Rec. Trav. Chim.*, i. 1-17 and 107-131; *Journ. Chem. Soc.*, 1883, 89.) After a historical sketch of the discussion as to the identity or isomerism of the bases, C_9H_7N , obtained from the cinchona alkaloids (quinoline), and from coal-tar (leucoline), the authors describe the methods which they adopted for purifying the bases obtained from these two sources, and give as the mean results of their analyses of both bases: C = 83.58, H = 5.8 per cent. The boiling points found were: for quinoline, $238.25-239.25^\circ$, and for leucoline, $239.25-240.25^\circ$ (thermometer wholly in vapour). Moreover, both yield the same hydrate, $2 C_9H_7N, 3 H_2O$, platinochloride, $(C_9H_7N)_2, H_2PtCl_6 + 2 H_2O$, dichromate, $(C_9H_7N)_2 H_2Cr_2O_7$, and argentonitrate. By oxidation with potassium permanganate in alkaline solution, both bases yield, as principal products, carbonic anhydride and quinoleic acid, $C_7H_5NO_4$, according to the equation, $C_9H_7N + O_9 = C_7H_5NO_4 + 2 CO_2 + H_2O$, together with very small quantities of oxalic acid and ammonia. The identity of the bases from the two sources may therefore be regarded as established, and the name "leucoline" may be dropped.

The quinoleic acid may be separated from the products by neutralizing with nitric acid, removing the crystals of potassium nitrate which separate on concentration, then precipitating with calcium nitrate, treating the concentrated filtrate with lead nitrate, decomposing the resulting precipitate with hydrogen sulphide, and concentrating the solution filtered therefrom. Quinoleic acid is then deposited in small honey-yellow monoclinic crystals, having the axes $a : b : c = 0.5418 : 1 : 0.6075$ and $\beta = 64^\circ 54'$. Observed faces, $\infty P, P^\infty, \infty P^\infty$, and a pyramidal face not determined. Cleavage, parallel to the clinopinacoid.

Quinoleic acid is but slightly soluble in cold, rather more so in hot water, very slightly soluble in alcohol, insoluble in benzene, and is removed from its aqueous solution by ether. It is but very slightly attacked by potassium permanganate in alkaline solution, easily in acid solution. When heated to 100° , it gives off CO_2 and leaves nicotic acid, $C_6H_5NO_2$. Heated in capillary tubes, it begins to turn brown at 175° , and melts at $228-230^\circ$, but if rapidly heated it melts at about 180° , giving off gas and resolidifying, after which it melts at 228° . Heated with lime, it yields an oil smelling of pyridine. A cold moderately dilute aqueous solution of this acid exhibits the following reactions. With—

Ca Cl₂: gelatinous precipitate, gradually becoming crystalline.

Ba Cl₂: gelatinous precipitate.

Zn SO₄: precipitate of microscopic needles after a few hours.

Mn SO₄: like the last, but smaller crystals.

CO(N O₃)₂: like the last; precipitate rose-coloured.

Ni SO₄ and Hg Cl₂: no precipitate.

Fe SO₄: orange colour; yellow-brown crystalline precipitate after some time.

Fe 2 Cl₆: yellow-brown, amorphous.

Cu SO₄: light-blue, apparently amorphous, nearly insoluble in water and acetic acid, even at boiling heat.

Hg(N O₃)₂: white precipitate; microscopic needles.

Pt(C₂H₃O₂)₂: like the last.

Ag N O₃: shining needles of acid salt (*infra*).

Quinoleic acid is a pyridine-dicarboxylic acid,—



it is therefore bibasic. The *acid potassium salt*, C₇H₄N O₄K, 2 H₂O, forms transparent triclinic crystals, which give off their water at 100°. The *normal barium salt*, C₇H₃N O₄Ba, obtained by adding a soluble barium salt to a cold solution of the acid neutralized with ammonia, crystallizes sometimes with 1½, sometimes with 2½ mols. H₂O, part of which goes off at 100°, the last semi-molecule only at 260°. The *normal silver salt*, C₇H₃N O₄Ag₂, is obtained by adding silver nitrate to a cold neutralized solution of the acid, as a gelatinous precipitate, which becomes granular or crystalline on standing. The *acid salt*, C₇H₄N O₄Ag + H₂O, is obtained by adding a hot aqueous solution of the acid to an acid solution of silver nitrate diluted with boiling water, and separates on cooling in concentric groups of shining needles. Sometimes, however, a *hyper-acid salt*, C₇H₄N O₄Ag, C₇H₅N O₄, is deposited, under these conditions, in concentric groups of small needles.

Quinoleic acid, when heated at 120–140° and upwards, gives off water and carbonic anhydride, and is converted into nicotic acid, C₆H₅N O₂ = C₇H₅N O₄ – C O₂. The same result is obtained by heating quinoleic acid with acetic acid. The nicotic acid thus produced agrees in character with that which is obtained by other methods. Its calcium salt, (C₆H₄N O₂)₂Ca, forms monoclinic crystals; *a* : *b* : *c* = 1·5372 : 1 : 0·6293. β = 62·50. Observed faces, ∞ P, P̄ ∞.

Bases of the Pyridine and Quinoline Series. O. de Coninck, (*Ann. de Chim. et de Phys.*, v. 433-532; *Journ. Chem. Soc.*, 1883. 738.) This long memoir is divided into three parts. In the first part the author gives a brief account, with references, of the results of previous researches on the pyridine and quinoline bases, under the heads: history; synthesis; bases having the same composition; oxidation products; hydrogenation products; physiological action; isomerism of leucoline and quinoline. The second part contains an exhaustive *résumé* of the author's researches on the fractional distillation of crude quinoline; the oxidation and hydrogenation of β -lutidine and β -collidine; hydrates of the pyridine bases; fractional distillation of oils from brucine; and the physiological action of the pyridine and quinoline bases. The conclusions drawn by the author from these experiments are summarized as follows:—

1. The distillation of cinchonine with potash furnishes two series of isomeric pyridine bases, amongst which are notably two lutidines and two collidines. The first fractions contain also methylamine and some fatty ethers, *e.g.*, amyl acetate.

2. The distillation of brucine with potash furnishes a small quantity of neutral products, and some pyridine bases, amongst others β -lutidine and β -collidine. The lower fractions contain a pyridine base insoluble in water, probably another lutidine.

3. β -Lutidine has been separated from its isomeride and obtained pure by a process generally applicable to the purification of the bases of these series.

4. β -Lutidine aurochloride undergoes modifications similar to those of the pyridine platinochloride, hitherto regarded as characteristic. By regulated oxidation, this base yields *nicotianic acid*. β -Lutidine is a violent poison, more energetic in its action than β -collidine.

5. The existence of β -collidine (b.p. 196°) in the crude quinoline from cinchonine and brucine, goes to prove definitely the isomerism of the pyridine bases derived from cinchonine and brucine with those derived from coal-tar and Dippel's animal oil.

6. By partial-oxidation, β -collidine furnishes *homonicotianic acid*, $C_5H_3MeN.COOH$, analogous to toluic acid. By further oxidation this acid becomes *cinchomeric acid*, $C_5H_3N(COOH)_2$, hence β -collidine may be regarded as *methyl-ethyl-pyridine*. By oxidation in hot solutions, β -collidine furnishes *nicotianic acid*. β -collidine is an antipyretic, a powerful poison, and has the curious property of preventing the reflex movements of the cornea.

7. The crude quinoline from cinchonine contains *tetrahydro-*

quinoline, the first instance of a hydroquinoleic base derived from an alkaloid containing oxygen; its existence confirms Wischnegradsky's hypothesis that the pyridine and quinoline bases exist in the alkaloids as hydrides.

8. Tetrahydroquinoline from cinchonine is isomeric with that formed by synthesis, and, like it, is transformed into quinoline by very feeble oxidizing agents. It constitutes an intermediate term between the two series of bases formed simultaneously in the destructive distillation of cinchonine with caustic potash.

9. Quinoline from cinchonine is mixed with tarry products, from which it can be easily separated. Purified from these products and from its homologue lepidine, which it retains with much persistence, it boils at $236-237^{\circ}$ (corrected) under a pressure of 775 mm. In certain cases of fever (hectic fever), quinoline acts more powerfully than quinine.

10. Pyridine appears to be as violent a poison as β -lutidine. The author concludes from a careful review of the formation and properties of pyridine and quinoline, and their homologues, and of their oxidation-, reduction-, and substitution-products, that all the known facts are in favour of Körner's theory that pyridine is correctly represented by Kekulé's formula for benzene, (N)''' taking the place of one of the (C H)''' groups, and that quinoline is similarly related to naphthalene, the higher homologues of these bases being formed, like the homologues of benzene and naphthalene, by the introduction of lateral chains of methyl, ethyl, propyl, etc., in place of hydrogen.

Action of Bromine on Quinoline and Pyridine. E. Grimaux. (*Comptes Rendus*, xcv. 85-87, and *Journ. Chem. Soc.*, 1882, 1215.) Two parts of bromine are added to a well-cooled mixture of 1 part quinoline with 1-3 parts of water, and the red product which separates out is dissolved in chloroform at a gentle heat. The slender red needles which separate out on cooling are very unstable, and lose bromine and hydrobromic acid when exposed to the air. The ratio of carbon to bromine is C_9 to Br_4 , and the formula of the compound is therefore $C_9H_7NBr_4$. On treatment with potash or hydrogen sulphide, it yields the original quinoline. If the chloroform solution is *boiled* for five or six minutes, and left at rest, hard bulky red-brown crystals of *hydrobromide of quinoline bromide* are deposited after twenty-four hours. The same compound is obtained by moistening the crude bromide with its own weight of alcohol. After some time heat is developed, the liquid boils, and the bromide dissolves. On cooling, large red crystals of the hydrobromide are

deposited, and the odour of bromal is perceived. *Hydrobromide of quinoline bromide*; $C_9H_7N, Br_4, H Br$, forms large red anhydrous prisms melting at 86° , very soluble in alcohol and ether, slightly soluble in hydrobromic acid, insoluble in water and chloroform. When heated with water, it is converted into quinoline hydrobromide, and the same change is effected by hydrogen sulphide. When treated with ammonia it is decomposed with evolution of nitrogen. It dissolves in potash and in sodium carbonate, and hydrobromic acid precipitates from the solution a yellow powder having the same melting point as the original substance. By prolonged treatment with potash it is converted into quinoline.

Pyridine under the same conditions also combines directly with bromine to form a still more unstable compound, which crystallizes in long needles, and may be isolated by dissolving the crude product in cold chloroform, and then placing the solution in a freezing mixture. If the chloroform solution is boiled, or if the crystals are moistened with alcohol, the bromide is converted into *hydrobromide of pyridene bromide*, $(C_5H_5Br_2)_2 H Br$, which forms large red fragile plates melting at $125-126^\circ$, soluble in water, hydrochloric acid, alcohol, and ether. It also dissolves in potash and in sodium carbonate, the original compound being precipitated from these solutions on addition of acids. By prolonged action of potash or by the action of hydrogen sulphide, the hydrobromide is converted into pure pyridene, b. p. 116° . It is decomposed by ammonia, with evolution of nitrogen, and when boiled with water gives off ammonia.

The β -lutidine described by Oechsner also yields an unstable compound, which forms large red-brown crystals melting at 64° . These compounds are analogous to the hydrobromide of dibromonicotine dibromide, $C_{10}H_{12}Br_2N_2, Br_2, H Br$, described by Huber. The nicotine tetrabromide of Cahours and Étard is most probably dibromonicotine dibromide. The analogy between these nicotine bromides and the pyridine bromides indicates that nicotine contains a non-hydrogenised pyridine group.

Conversion of Pyrroline into Pyridine. G. L. Ciamician and M. Dennstedt. (*Ber. der deutsch. chem. Ges.*, xv. 1172-1181, and *Journ. Chem. Soc.*, 1882, 1214.) The authors have previously obtained by the action of chloroform on pyrroline a compound which appeared to be a chloropyridine; but as they were unable to remove the chlorine from the product, they were unable to speak with certainty as to its nature. They have now investigated the action of bromoform on pyrroline, and found the compound produced to

be identical with the bromopyridine which Hofmann obtained by the direct action of bromine on pyridine.

Monobromopyridine is a liquid of strongly alkaline reaction; it boils at $169\cdot5^\circ$ under a pressure of 760·5 mm., and has sp. gr. of 1·645 at 0° . Monobromopyridine hydrochloride can be obtained in deliquescent needles. The platinochloride, $(C_5H_4BrN, HCl)_2$, $PtCl_4 + 2H_2O$, crystallizes in honey-yellow prisms belonging to the monoclinic system— $a : b : c = 1\cdot20735 : 1 : 1\cdot18815$. Observed forms, 110, 101, 001, $\bar{1}01$, 302, 011.

On treatment with bromine at $230\text{--}250^\circ$, monobromopyridine is converted into Hofmann's dibromopyridine.

Carbon tetrachloride, acting on potassium-pyrroline, also converts it into monochloropyridine; from which it would seem that the chlorine atom is attached to that carbon atom which has newly entered the pyridine molecule.

Bromopyridine, unlike chloropyridine, is easily reduced by nascent hydrogen, a mixture of pyridine and dihydropyridine being obtained.

Researches on Pyridine. H. Weidel and M. Russo. (*Monatsh. Chem.*, iii. 850–885; *Journ. Chem. Soc.*, 1883, 483.) Andersen, by heating pyridine with sodium, obtained a base which he regarded as *dipyridine*, $C_{10}H_{10}N_2$, together with other products. The authors of the present paper, following Andersen's process with some modifications, for which reference must be made to the original paper, have also obtained dipyridine, but they find that the chief products are: a base, $C_{10}H_8O_2$, isomeric with the dipyridyl which Skraup and Vortmann obtained by distilling dipyridyl-carboxylic acid, $C_{12}H_8N_2O_4$, with lime; and isonicotine, $C_{10}H_{14}N_2$.

The base, $C_{10}H_8N_2$, thus obtained is distinguished by the authors as " γ -dipyridyl." It may be purified by crystallization from boiling light petroleum (from which it separates in crystals on cooling), and distilling it in a current of steam. It dissolves very readily in alcohol, ether, benzene, and chloroform, somewhat less in ether, and is nearly insoluble in cold, but easily soluble in hot water. When heated it melts and sublimes in long needles. Small quantities of it volatilise with vapour of water. The aqueous solution has a faintly alkaline reaction. The base has a bitter taste, no smell at ordinary temperatures, but when heated it gives off faintly odorous cough-exciting vapours. It melts at 114° and boils at $308\cdot8^\circ$ (bar. 760 mm.).

These are the properties assigned by Andersen to his dipyridine, $C_{10}H_{10}N_2$. The authors, however, find that the base in question

gives, as a mean of several closely agreeing analyses, 76·87 per cent. C, 5·18 H, and 17·95 N, leading to the formula $C_{10}H_8N_2$, which requires 76·92 C, 5·13 H, and 17·95 N. This formula has further been confirmed by the analysis of several salts.

The anhydrous crystals of γ -dipyridyl absorb water from the air with great avidity, the melting point of the hydrated substance thus formed sinking, according to the time of exposure, to 107° , 104° , 96° , and finally to 73° , which last is the melting point of the crystals deposited from aqueous solution. The hydrate, $C_{10}H_8N_2 \cdot 2H_2O$, thus obtained, gives off the greater part of its water at 100° , the remainder only on distillation.

γ -Dipyridyl methiodide, $C_{10}H_8N_2 \cdot 2MeI$, is formed on adding methyl iodide in excess to a solution of the base in methyl alcohol; and separates on evaporation over sulphuric acid, in large, yellow-red, highly lustrous, monoclinic crystals, O P. ∞ P. Treated with potash-lye or silver oxide, it does not yield the corresponding base in definite form. The reaction above described shows that γ -dipyridyl has the character of a tertiary amine.

Oxidation of γ -Dipyridyl.—This base in the free state offers great resistance to the action of oxidizing agents, but in the form of sulphate it is easily oxidized by potassium permanganate, yielding *pyridine-monocarboxylic* or *isonicotinic acid*, according to the equation $2C_{10}H_8N_2 + 23O = 2(C_5H_4N \cdot COOH) + 8CO_2 + 3H_2O + N_2$. This acid, after purification, forms a white crystalline mass, melting at 307° , and identical in every respect with that which Weidel and Hübner obtained by oxidation of nicotine.

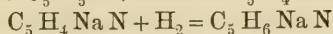
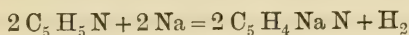
Action of Nascent Hydrogen.— γ -Dipyridyl, treated with tin and hydrochloric acid, takes up 6 atoms hydrogen, and is converted into isonicotine: $C_{10}H_8N_2 + 3Sn + 6HCl = 3SnCl_2 + C_{10}H_{14}N_2$. This base, separated from the product in the usual way, and purified by drying in a vacuum at 150° , and subsequent distillation in hydrogen, forms a colourless oil, which solidifies on cooling to a mass of slender needles, and turns yellow in the air, especially in the fused state. It is extremely hygroscopic, deliquesces in water, alcohol, or wood-spirit, and dissolves readily in ether, light petroleum, and benzene. It has a strongly alkaline reaction, and cauterises the skin like caustic potash. When pure it is nearly scentless at ordinary temperatures, but when gently heated it emits a faint odour somewhat like that of commercial opium; at higher temperatures it emits a pungent vapour. It has an acrid alkaline taste, and acts on the animal economy as a poison, like nicotine, but much less strongly. In aqueous solution, and especially when

neutralized with sulphuric acid, it is easily oxidized by potassium permanganate to isonicotinic acid. Its salts are deliquescent, and crystallize with difficulty, even from the most concentrated solutions.

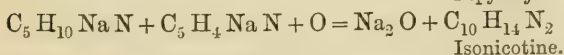
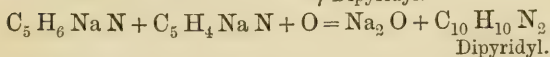
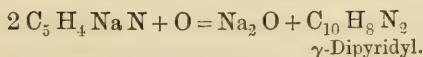
The *methiodide*, $C_{10}H_{14}N_2, 2MeI$, crystallizes from its solution in methyl alcohol by spontaneous evaporation, in monoclinic or triclinic crystals.

Isonicotine, as already observed, is also found among the products obtained by the action of sodium on pyridine; and its formation, together with that of γ -dipyridyl and dipyrindine, is supposed by the authors to take place in two stages, the first consisting in the formation of sodium-pyridine, C_5H_4NaN , and certain products formed therefrom by addition of hydrogen; the second in the action of the air on these products. This series of actions may, perhaps, be represented by the following equations:—

I.



II.



Certain resinous and oily products, of no decided basic character, formed at the same time, are probably due to the further action of the sodium on the dipyridyl or on the sodium-pyridine.

Artificial Preparation of Piperine. L. Rügheimer. (*Ber. der deutsch. chem. Ges.*, xv. 1390.) When piperic acid, dissolved in anhydrous benzol, is allowed to act on a benzol solution of an excess of piperidine, hydrochlorate of piperidine is deposited, while the filtrate contains piperine. This filtrate may be freed from the excess of piperidine and other impurities by repeatedly shaking it with dilute hydrochloric acid and then with water, and allowing to stand until no further separation of crystals takes place. If now the filtered benzol solution is distilled until the greater part of the solvent has passed over, and the residue treated with light petroleum until a precipitate is produced, the filtrate thus obtained yields, upon spontaneous evaporation, crystals of piperine fusing at

125–127° C., and answering to the formula $C_{17}H_{19}NO_3$. When purified by repeated recrystallization, these crystals fuse at a slightly higher temperature (127–128° C.).

Piperidine and Pyridine. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xvi. 586–591.) Previous experiments on the action of bromine on piperidine (*Ber.*, xii. 984), led the author to assume a relationship between the latter base and pyridine. This has since been established by Königs, who obtained pyridine by the oxidation of piperidine, and also by Schotten, who obtained dibromopyridine by the action of bromine on piperidine. The author, by modifying his former experiments, has succeeded in obtaining pyridine from piperidine. He combines the latter with acetic anhydride, and gently warms the resulting compound (1 mol.) with bromine (2 mols.). Hydrobromic acid is evolved, whilst a colourless distillate, consisting of acetic bromide and its substitution-derivatives, passes over, leaving a syrupy residue in the retort. On treating the residue with alkali and steam-distilling, an alkaline aqueous distillate and an oily layer, together with crystals of dibromopyridine, are obtained. After recrystallization from alcohol, the latter melts at 112° and boils at 222°. On adding potassium hydroxide to the aqueous distillate, an oily layer separates, consisting of pyridine mixed with unaltered piperidine. The latter is readily separated by treatment with acetic anhydride, and then distilling, when nearly pure pyridine is obtained. The oily portion of the steam distillate contains monobromopyridine, C_5H_4BrN , which the author previously obtained by the bromination of pyridine. It forms a platinochloride, $(C_5H_4BrN)_2, H_2PtCl_6$, crystallizing in flat needles, and an aurochloride, $C_5H_4BrN, HAuCl$, crystallizing in plates.

An attempt to reverse the process, and to obtain piperidine from pyridine, was unsuccessful. Pyridine was heated with concentrated hydriodic acid, when normal pentane and ammonia were produced.

Piperidine. C. Schotten. (*Ber. der deutsch. chem. Ges.*, xv. 421–427, and *Journ. Chem. Soc.*, 1882, 982.) Amylpiperidine, prepared by digesting piperidine, amyl bromide, and potash, is a colourless liquid (b. p. 188°). It combines with methyl iodide with evolution of heat, forming a crystalline mass of *methylamylpiperidyl ammonium iodide*, which crystallizes from hot alcohol in thick prisms melting at 195°. When distilled with silver oxide it yields, besides a small quantity of amylene, *methylamylpiperidine* (b. p. above 190°); it is a liquid scarcely soluble in water, and lighter than it. Its odour is more ammoniacal than that of amylpiperidine.

Its *hydrochloride* melts easily, and is hygroscopic. The *plantino-chloride*, $(C_5 H_9 N Ayl_2 Me, H Cl)_2 Pr Cl_4$, is slightly soluble in water, melts under water below 100° ; in capillary tubes it softens at 100° , and melts at 140° . Methylamylpiperidine can be heated in a sealed tube with hydrochloric acid without being altered, but is decomposed when the dry hydrochloride is heated in a stream of hydrochloric acid gas, and produces a hydrocarbon, methylpiperidine, and piperidine. Piperidine is recognised in a mixture of its substitution-products, from the fact that when treated with a dilute acid and potassium nitrite, it forms the nitroso-derivative (see below) which can be extracted by agitation with ether. Methylamylpiperidine combines with methyl iodide, with slight evolution of heat, forming a crystalline addition-product.

Benzyl-piperidine, prepared by the action of benzoic chloride on piperidine, is an oil (b. p. 245°) lighter than water, and almost insoluble in it. It combines with methyl iodide, with development of heat, to form the ammonium iodide, $C_5 H_{10} N. C_7 H_7 MeI$, which crystallizes from hot absolute alcohol in thick prisms melting at 145° , and decomposing at a higher temperature, giving off benzyl iodide. Treatment with silver oxide converts this ammonium iodide into an ammonium base, which, on heating, is resolved into water, and the volatile *methylbenzyl-piperidine*, which resembles benzylpiperidine in boiling point (245°) and many of its properties. At the same time there are formed small quantities of benzyl alcohol and a low boiling base, probably a compound of methyl-piperidine with methyl iodide. The new base forms a methiodide, which may be crystallized from hot alcohol; it gives off benzyl iodide when heated above its melting point. The ammonium base formed by the action of silver oxide on this iodide decomposes at a higher temperature, *piperylene* being among the products of decomposition. Large quantities of methylbenzyl-piperidine and benzyldimethylamine are also formed. There was also a small quantity of benzyl alcohol.

Nitrosopiperidine is best prepared by treating a dilute sulphuric or hydrochloric acid solution of piperidine with somewhat more than the calculated quantity of potassium nitrite. Thus prepared, it is a yellow aromatic liquid (b. p. 218°), soluble in concentrated hydrochloric acid, from which it is reprecipitated by water; it is heavier than water. When heated in a sealed tube with acids, it is converted into piperidine and nitrous acid; with phosphoric anhydride or zinc chloride a trace of piperylene is formed, but the greater part becomes resinous; treated with sodium amalgam it is

reduced to ammonia, piperidine, and a small quantity of a crystalline base which melts at 58° and volatilises with steam.

Piperylurethan, $C_5H_{10}N.CO.OEt$, the product of the action of ethyl chlorocarbonate on piperidine, is a colourless liquid boiling at 211° without decomposition; it has a slightly bitter and astringent taste, a pleasant odour, is heavier than water, almost insoluble therein, and is precipitated by water from its hydrochloric acid solution. It is not at all, or only very slightly, poisonous. Boiling with strong potash or hydrochloric acid does not decompose it; when, however, it is heated at 100° in a sealed tube with hydrochloric acid, it is resolved into piperidine, carbonic anhydride, and ethyl chloride. With ammonia or piperidine it yields easily soluble carbamides; it becomes resinous when heated with phosphoric anhydride.

Acetyl- and Oxalyl-piperidine.—The former, which is the product of the action of acetic chloride on piperidine, is a liquid boiling at 224° , and miscible in all proportions with water. The latter is prepared by heating together equal weights of piperidine and ethyl oxalate, and distilling the product. Oxalyl-piperidine, $(C_5H_{10}N.CO)_2$, (b. p. above 360°), crystallizes in needles melting at 90° , soluble in water, alcohol, and ether, insoluble in concentrated alkalies. By heating piperidine with excess of bromine (10 atoms to 1 mol. of piperidine) for four hours in a sealed tube at 180° , dibromopyridine is formed.

Oxidation of Piperidine. C. Schotten. (*Ber. der deutsch. chem. Ges.*, xvi. 643–649. *Journ. Chem. Soc.*, 1883, 813.) The author has shown that an acid of the formula $C_7H_{15}O_2N$ (for which he now suggests the name *coninic acid*) is produced by the action of nitric acid on conylurethane. Under similar conditions, piperylurethane yields *piperidinic acid*, $C_4H_9O_2N$, homologous with the latter; its *hydrochloride*, $C_4H_9O_2N.HCl$, forms dense hygroscopic prisms, readily soluble in water and in alcohol; its *platinochloride*, $(C_4H_9O_2N)_2.H_2PtCl_6$, forms large shining prisms. If urea is added to the nitric acid to moderate its action, *nitrodehydropiperylurethane*, $C_5H_7(NO_2)N.CO.OEt$, is produced, crystallizing in yellowish needles or prisms melting at 51.5° and soluble in hot water or in alcohol. It is not readily acted on by acids, whilst alkalies dissolve and decompose it even in the cold. When it is treated with tin and hydrochloric acid, and the solution is then heated with concentrated hydrochloric acid in sealed tubes above 100° , an oil is obtained which is probably dehydropiperidine. On adding bromine to its solution in glacial acetic acid, it forms a

bromhydroxyl-derivative, $C_5H_7(NO_2)N(HOBr).COOEt$, which crystallizes in prisms melting at 157° . *Piperylmethylurethane*, $C_5H_{10}N.COOMe$, is prepared in the same way as the ethyl-compound, and forms a colourless liquid (b. p. 201°) having a slight and agreeable odour. It is heavier than water, in which it is sparingly soluble, and can be boiled with alkalies or with hydrochloric acid without decomposition. It yields a *nitrodehydro-derivative*, $C_5H_7(NO_2)N.COOMe$, which crystallizes in yellowish needles melting at $102-103^\circ$; and by the action of bromine on this a body is obtained melting at 130° . By the action of bromine on *piperylethylurethane*, the compound, $C_5H_7BrN(HOBr).COOEt$, is produced, crystallizing in short, hard, shining prisms, which melt at 140° . If twice as much bromine is used as is necessary to form this body, dibromopyridine is produced.

Kairine. Drs. Fischer and W. König, and Prof. Filehne. (*Chem. and Drugg.*, from *Wiener Medicinische Blätter*, and *Pharm. Centralhalle*, Nov. 23, 1882.) A new alkaloid, called "kairine," is about to appear in the drug market, for which are claimed antipyretic properties, unaccompanied by the slightest tendency to produce local irritation. It is proposed as a substitute for chinoline, itself a substitute for quinine. The authors have found that those hydrides of chinoline in which the nitrogen atom is in direct combination with the carbon atom of a methyl group or of another alcohol radical, all possess more or less the properties above mentioned as pertaining to kairine.

Kairine is the name given by the authors to oxychinoline-methyl-hydride.

Kairine hydrochlorate forms a light greyish yellow crystalline powder. It is soluble in water, and has a bitter, aromatic taste.

The authors have found that, beginning with doses of from 0.3-0.5 to 1.0 gram of the above salt, and gradually increasing the dose 0.5 gram each time, the doses being repeated at intervals of an hour, after the fourth dose, the body temperature may be reduced to $37.0^\circ C.$, or even $36.5^\circ C.$, without any symptoms of local irritation; and they hope that the substance will prove useful in all forms of fever.

Presence of Nicotine in Tobacco Smoke, and Consideration of the Active Poison in the Combustion-products of Tobacco. R. Kissling. (*Dingl. polyt. Journ.*, ccxlv. 234-246. From *Journ. Chem. Soc.*) Having discussed in a previous paper the principal publications on this subject, the author proceeds to give an account of his own investigations on the composition of tobacco smoke, mainly

with a view of proving the presence of nicotine. His experiments were made with cigar smoke, as this is the form in which tobacco is most extensively consumed, the prevailing conditions being less complicated than the smoking of tobacco from pipes of various shapes. The smoke of a cigar was drawn by means of an aspirator through a long condensing tube and a system of five flasks. The first and third flasks were empty, the second contained alcohol, the fourth dilute sulphuric acid, and the fifth weak soda-lye. The current of air, and with it the intensity of smoking, was regulated, so that a cigar lasted for about half an hour. The ingredients condensed and absorbed in the various flasks were then examined.

Full details are given of the various experiments and of the methods of examination employed, the results being arranged in a series of tables.

In discussing these results, the author mentions that, although the presence of nicotine in tobacco smoke can be detected qualitatively with great ease, it is difficult—in fact it seems impossible—to effect an approximate separation of nicotine from the condensation-products of the smoke. Without wishing to dispute the assumption that the various basic substances formed by the combustion of tobacco are comparatively numerous, the author is led

Table A.					Experiment 1.	
					grams.	p.c.
Tobacco used					406·675	...
Percent. nicotine . . . . .					...	3·75
Total nicotine					12·250	...
Tobacco smoked					350·42	...
Nicotine smoked					13·141	...
Nicotine obtained from the smoke					6·836	...
The same calculated on smoked nicotine . . . . .					...	52·02
The same calculated on total nicotine . . . . .					...	44·83
Tobacco not smoked.					56·255	...
The same calculated on total tobacco . . . . .					...	13·83
Nicotine obtained from tobacco not smoked					2·832	...
The same calculated on tobacco not smoked . . . . .					...	5·03
The same calculated on total nicotine . . . . .					...	18·57
Decomposed nicotine					5·582	...
The same calculated on total nicotine . . . . .					...	36·60

to conclude from the properties exhibited by the basic mixtures he has isolated, that besides nicotine they contain, in appreciable quantity only, the lower members of the picoline series. As the difference in the boiling points between the picoline bases and nicotine increases, the platinum in their platinochlorides approaches that of nicotine platinochloride, so that by determining simultaneously both these points, it was possible to ascertain with some degree of certainty the existence of a considerable contamination of the nicotine with picoline bases. The following are the boiling points and the percentage of platinum in the platinochlorides:—

	Boiling point.			Percentage of Platinum.		
Pyridine	.	.	115°	.	.	34·68
Picoline	.	.	135	.	.	33·05
Lutidine	.	.	155	.	.	31·58
Collidine	.	.	171	.	.	30·23
Parvoline	.	.	188	.	.	29·00
Coridine	.	.	211	.	.	27·84
Rubidine	.	.	230	.	.	26·82
Vividine	.	.	251	.	.	25·81
Nicotine	.	.	242	.	.	34·36

The quantities of nicotine given in Table A were calculated in the following manner:—As the boiling points of the isolated nitro-

Experiment 2.		Experiment 3.		Experiment 4.		Experiment 5.	
grams.	p.c.	grams.	p.c.	grams.	p.c.	grams.	p.c.
341·60	...	798·00	...	513·00	...	...	...
...	3·75	...	0·30	...	0·19	...	2·24
12·810	...	2·394	...	0·975	...	...	...
216·60	...	700·00	...	441·00	...	...	...
8·123	...	2·100	...	0·838	...	...	...
2·261	...	1·769	...	0·588	...	...	...
...	27·83	...	84·23	...	70·16	...	...
...	17·65	...	73·89	...	60·32	...	...
125·00	...	98·00	...	72·00	...	250·00	...
...	36·59	...	12·28	...	14·03	...	...
5·640	...	...	...	...	...	6·278	...
...	4·51	...	...	...	...	...	2·51
...	44·03	...	...	...	...	...	...
4·909	...	...	...	...	...	...	...
...	38·32	...	...	...	...	...	...

genous bases (with one exception) were always above 200° , the percentage of their platinochlorides formed the essential point of deciding their constitution. When below 34.15 per cent., the corresponding numbers were calculated as pure nicotine; the same applied to those cases where the percentage of platinum was higher than 34.5, as here probably a partial separation of metallic platinum, caused by the presence of a small quantity of pyrroline, had occurred. An extreme case (35.51 per cent. Pt) was obtained in experiment 3, in which unquestionable contamination with metallic platinum had taken place; 80 per cent. of the nitrogenous bases obtained was calculated as nicotine. When the percentage was below 33.7 the corresponding numbers were disregarded. In cases where the values were within 34.15 and 33.90 per cent., and 33.90 and 33.70 per cent., 90 and 80 per cent. of the corresponding nitrogenous bases were relatively calculated as nicotine. In experiment 4 the basic mixture began to boil at 130° , whilst the percentage of platinum in the platinochloride was 34.13 per cent. It must therefore be assumed that the mixture was contaminated more largely with the lower boiling picoline bases: hence only 80 per cent. of the corresponding nitrogenous bases has been calculated as nicotine. With the numbers thus obtained the following values were calculated (*see table on preceding page*).

Specific Rotatory Power of Nicotine and of some of its Salts.
P. Schwebel. (*Ber. der deutsch. chem. Ges.*, xv. 2850.) The molecular specific rotatory powers of nicotine and of the salts investigated are given in the following table:—

						$\frac{A P}{100} = M.$
Nicotine	.	.	.	.	.	— 261.71
„ Hydrochlorate	.	.	.	.	.	+ 102.23
„ Acetate	.	.	.	.	.	+ 110.29
„ Sulphate	.	.	.	.	.	+ 83.43

Whereas the free base is lævorotatory, its salts are dextrorotatory, and these values for the molecular rotatory power bear no relation to each other.

Conhydrine. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xv. 2313.) The author contradicts Wertheim's statement that conhydrine, $C_8H_{17}NO$, when acted upon by phosphoric anhydride or other dehydrating agents, yields conine. The oily liquid obtained in this reaction is not conine, but a mixture of different compounds.

Quassiin. A. Christensen. (*Archiv der Pharm.* [3], xx. 481–492.) The author exhausted quassia with water, and precipitated the quassiin by tannin, after neutralization with sodium carbonate. The tannate was mixed with lead carbonate (or calcium hydroxide), dried, and the quassiin was extracted by alcohol. The author found the amount of quassiin in the quassia to vary largely, some specimens yielding scarcely any. Pure quassiin, purified by recrystallization from hot alcohol, crystallizes in very thin rectangular plates, which are biaxial, and doubly refracting. It is bitter, odourless, permanent in the air, and its solutions are neutral. It melts at 205° , swelling up slightly to a resinous mass of unchanged quassiin. It is readily soluble in alkalies, and is reprecipitated by acids. It is soluble in boiling alcohol, less so in cold. Ether and light petroleum dissolve it with difficulty, chloroform very easily. It is dextrorotatory, its specific rotatory power for $[\alpha]_D$ being $+37.8$. Its formula is $C_{31}H_{42}O_9$ ($C_{20}H_{25}O_6$, Wiggers). It is precipitated by tannin. It is not a glucoside, but by the prolonged action in the water-bath of 3 per cent. sulphuric acid, a body, $C_{31}H_{33}O_9$, is formed, which dissolves sparingly in water, giving no precipitate with tannin; unlike quassiin, its aqueous or alcoholic solution reduces silver nitrate; a resin is simultaneously formed by the action of the dilute acid.

A bromo-derivative of quassiin (m. p. 75°) was formed by the action of bromine in chloroform solution. Contrary to the statements of Bennerscheidt, the author found free fatty acids in quassia wood, but no essential oil.

Æsculetin. F. Tiemann and W. Will. (*Ber. der deutsch. chem. Ges.*, xv. 2072–2084; *Journ. Chem. Soc.*, 1883, 199.) Coumarin, umbelliferone, and æsculetin are represented respectively by the following formulæ:— $C_9H_6O_2$, $C_9H_6O_3$, $C_9H_6O_4$. Since umbelliferone has been shown by Tiemann and Reimer (*Ber.*, xii. 993) to be a hydroxycoumarin, it is obvious that æsculetin may be represented as a dihydroxycoumarin. When the hydrogen of the hydroxyl in umbelliferone is replaced by methyl, the ether thus produced shows all the properties of coumarin; the authors have therefore endeavoured to show that by replacing 2 atoms of hydrogen in æsculetin by methyl, a body is produced behaving exactly as coumarin. By the usual process the authors obtain a mixture of mono- and di-methylæsculetin, easily separable by ammonia, in which the latter is insoluble. *Monomethylæsculetin* melts at 184° . *Dimethylæsculetin* crystallizes in shining white needles melting at 144° . Dimethylæsculetin, methylumbelliferone, and coumarin,

behave in an exactly similar manner towards reagents,—solutions of potassium hydroxide, for example. Further, all three exhibit fluorescence. These resemblances point to a similarity in constitution.

The authors have endeavoured to obtain further evidence on this point. Perkin has shown that by the action of methyl iodide on sodium coumarin, in presence of methyl alcohol isomeric ethers may be obtained, according to the conditions of experiment; and he has also obtained two isomeric ethers and the corresponding acids by other methods. The authors have repeated Perkin's work, and fully confirm it; and they have further shown that by oxidation of both α - and β -orthocoumaric acids, one and the same methylsalicylic acid is formed. They have applied these reactions to methylumbelliferone and α -esculetin.

Methylic dimethoxyumbellate, $C_6H_3(CH:CH.COOMe)(OMe)(OMe)[1:2:4]$, produced by the usual process from methylumbelliferone, forms shining white needles melting at 87° . No isomeric ether could be obtained, although the temperature used did not exceed 100° (that used by Perkin); but the authors think it not impossible that an ether analogous to that of α -methylorthocoumaric acid may be produced, but being much less stable than the latter, is transformed at once into its isomeride.

Dimethoxyumbellic acid, $C_6H_3(CH:CH.COOH)(OMe)_2[1:2:4]$, is prepared by saponification of the ether, and melts at 184° . On oxidation it yields the acid, $C_6H_3(COOH)(OMe)_2[1:2:4]$.

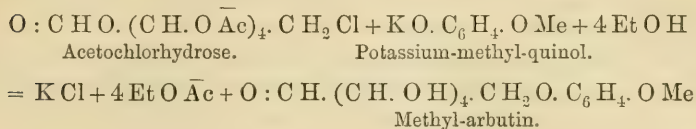
Methyl trimethoxyæsculeate, $C_6H_2(CH:CH.COOMe)(OMe)_3$, prepared from dimethylæsculetin in the same manner as the corresponding compound from methylumbelliferone, forms very pale yellow glistening prisms melting at 109° . On saponification it yields the corresponding acid, which melts at 168° . From want of material, the oxidation-products of the latter could not be determined.

These researches show that methylumbelliferone and dimethylæsculetin give exactly analogous results, when their sodium-compounds are treated with methyl iodide in methyl alcohol solution, and hence there can be little doubt that æsculetin is a dihydroxycoumarin. The authors hope to determine from which trihydroxybenzene æsculetin is derived.

Arbutin and Helicin. H. Schiff. (*Gazz. Chim. Ital.*, xii. 460-469.)

Arbutin.—The variations in the amount of water of crystallization and in melting point (142 – 145° , 162 – 168° , and 187°) observed in commercial arbutin, are attributed by the author to the presence of methyl-arbutin. This latter compound has been prepared by

Michael by the action of acetochlorhydrose on the potassium-derivatives of methyl-quinol, according to the equation:—



When thus obtained it melts at 168–169°, *i.e.*, at about the temperature observed by Strecker and others for the melting point of arbutin, whereas the methyl-arbutin prepared by the author's method, *viz.*, by the action of methyl iodide and potassium hydroxide on arbutin dissolved in methyl alcohol, melts at 175–176°. The two products differ also in their amount of water of crystallization, the crystals obtained by Michael's process having the composition $2 \text{ C}_{13} \text{ H}_{14} \text{ O}_{17} + \text{H}_2 \text{ O}$, while those obtained by the author's method contain $\text{C}_{13} \text{ H}_{14} \text{ O}_{17} + \text{H}_2 \text{ O}$. The smaller amount of water found by Michael was perhaps due to partial dehydration. Methyl-arbutin is moderately soluble in cold, freely in boiling water, and in alcohol, sparingly in ether, more freely in a mixture of alcohol and ether; its solutions give no colour with ferric chloride.

The lower melting point (168°) observed for arbutin by Strecker and others, and by the author in certain fractions, may perhaps be attributed to the presence of methyl-arbutin, and may be regarded as an additional instance of the fact that a mixture may melt at a temperature lower than the melting point of either of its constituents.

Constitution of Helicin.—When hot saturated solutions of helicin (5 parts) and urea (2 parts) are mixed together, and the mixture is evaporated in an open vessel, there remains a dense, colourless syrup, which, when left in the exsiccator over sulphuric acid, leaves a nearly colourless gummy mass, gradually changing to a white crystalline powder, which is but slightly soluble in absolute alcohol, and may be freed thereby from uncombined helicin and urea. This compound dissolves in a large quantity of boiling water, and separates on cooling in the form of a very white crystalline powder, consisting of glucosalicyl-carbamide, $(\text{N H}_2. \text{C O N H})_2 \text{ C H. C}_6 \text{ H}_4. \text{O. C}_6 \text{ H}_{11} \text{ O}_5$. It is distinguished from its components by being hygroscopic and very soluble in water. It deliquesces in alcohol of 99 p.c., dissolves readily in alcohol of 95 p.c., and is not precipitated by absolute alcohol, even from highly concentrated aqueous solutions. The aqueous solution has a bitter taste, and is not pre-

precipitated by nitric acid, but gives a white flocculent precipitate with mercuric nitrate. The compound melts at a high temperature, giving off ammonia, becoming coloured, and apparently decomposing in a very complex manner.

Glucososalicyl-thiocarbamide, $(\text{NH}_2 \cdot \text{C} \cdot \text{S} \cdot \text{NH})_2 \cdot \text{CH} \cdot \text{C}_6\text{H}_4 \cdot \text{O} \cdot \text{C}_6\text{H}_{11}$ prepared by heating together the alcoholic solutions of 1 part thiocarbamide and 2 parts crystallized helicin, is also a very white crystalline powder, even more hygroscopic than the carbamide.

The compounds just described afford additional proof of the aldehydic nature of helicin, which is, moreover, confirmed by its power of combining with organic bases, as with aniline and toluidine. With tolylene-diamine it forms *glucosalicylic tolylene-diamine*, $\text{C}_6\text{H}_3\text{Me} : (\text{N} : \text{CH} \cdot \text{C}_6\text{H}_4 \cdot \text{O} \cdot \text{C}_6\text{H}_5 \cdot \text{O}_5)_2$, which separates in deep orange coloured crystalline groups when 5 parts helicin and 2 parts tolylenediamine are dissolved together in a small quantity of hot water. Like most derivatives of metatoluidine, this substance exhibits a strong tendency to form deep-coloured compounds. Its dilute aqueous solution exhibits a decided red-green fluorescence. The crystals contain water, which they lose in the exsiccator, being thereby converted into a vitreous mass, which may be recrystallized from warm water; it dissolves but slightly in cold water, easily and with red colour in dilute hydrochloric acid.

Helicin unites readily with hydrocyanic acid, and yields with Perkin's reagent a mixture of well-crystallized compounds, which however, the author has not yet succeeded in separating.

Anhydrous helicin does not absorb dry ammonia-gas, but dissolves readily in concentrated alcoholic ammonia, forming a solution which has only the faintest ammoniacal odour, showing that the ammonia has really but little stability, and gives off ammonia even at ordinary temperatures. It is probably an additive aldehydic combination, $\text{C}_6\text{H}_{14}\text{O}_5 \cdot \text{O}_6\text{C}_6\text{H}_4 \cdot \text{CH}(\text{OH}) \cdot \text{NH}_2$, which, however, is not converted into the corresponding hydrosalicylamide under conditions similar to those which give rise to the formation of salicyl-aldehyde.

The paper concludes with theoretical speculations as to the constitution of helicin.

Synthesis of Salicin. A. Michael. (*Ber. der deutsch. chem. Ges.*, xv. 1922.) Lisenko has shown that helicin prepared from salicin may be reconverted into the latter by the action of sodium amalgam. In applying this reaction to artificial helicin, produced by the action of acetochlorhydrose on potassium salicylate, the

author has obtained salicin identical in all its properties with the natural product.

Coniferin in Beetroots. E. O. von Lippmann. (*Ber. der deutsch. chem. Ges.*, January 22, 1883; *Chem. and Drugg.*, May, 1883.) The author describes a method of extracting coniferin from beetroots. Woody, but sweet, beetroots, which give a good reaction with phenol and hydrochloric acid, are cut into slices, and extracted with absolute alcohol in a copper furnished with a helm so arranged that the alcohol continually flows back until the alcoholic extract ceases to polarise. The alcohol requires renewing three or four times to extract all the sugar, and the boiling must be continued for an hour and a half at each operation. After drawing off the alcohol, and when the beet slices have cooled, they are slowly stirred several times during the next twenty-four hours with cold water, and left to stand, pressing or squeezing being avoided. The whole is covered with boiling water and boiled until the beets swell up; the mass is then carefully pressed out in a cloth, and the liquor, which must be quite clear and but slightly coloured, boiled down. When the greater part of the water has evaporated, the solution is treated with sugar of lead, and if this produces only a slight precipitate, or none, basic acetate of lead and ammonia are added. These reagents must be added very carefully, and in small portions at a time, so as to avoid any excess, since the precipitate formed contains mucilaginous substances soluble in an excess of the precipitant, and cannot afterwards be removed. The whole is now filtered; any traces of lead precipitated with carbonic acid, and filtered off. Should a portion of this filtrate, on being tested with sulphuretted hydrogen, be darkened by this reagent, it is a proof that the filtrate contains organic lead salts not precipitated by carbonic acid, in which case a perfect purification cannot be effected, and all further labour is useless. Should this, however, not be the case, the filtrate is carefully evaporated to a thick syrupy consistency, whereupon a darkish coloration takes place, and a smell of vanilline is noticed. The syrup is placed in several flat vessels in desiccators over sulphuric acid to crystallize out, a crystal or two of previously formed coniferin having been first added to each vessel to accelerate the crystallization.

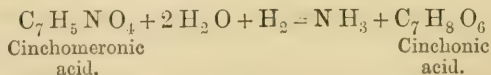
The author considers that coniferin is not contained ready formed in any considerable quantities in the cells of the beetroots, but that it is chiefly formed from a substance of a complicated composition—lignin—by boiling.

Coumarin. G. Ebert. (*Liebig's Annalen*, ccxvi. 139–161.) Coumarin dissolves in boiling baryta water, forming an unstable compound, which has not been isolated. Coumarin is also dissolved by a hot solution of potassium carbonate; an unstable compound is produced, which is soluble in alcohol and water. A hot alcoholic solution of sodium ethylate also has the power of dissolving coumarin.

The properties of *ethylcoumarinic acid*, $\text{Et O} \cdot \text{C}_6\text{H}_4 \cdot \text{CH} : \text{CH} \cdot \text{COOH}$ (α -ethylorthoxyphenylacrylic acid), have been previously described by Perkin. The calcium salt, $(\text{C}_{11}\text{H}_{11}\text{O}_3)_2\text{Ca} + 2\text{H}_2\text{O}$, crystallizes in glistening needles. 100 grams of the saturated solution at 21° contain 0.43 gram of the anhydrous salt. Barium ethylcoumarinate is deposited from an alcoholic solution in silky needles containing 2 mols. H_2O . Barium ethylcoumarate forms crystals containing 4 mols. H_2O . It is very soluble in alcohol, but is left as a gummy mass on evaporating the solution. Both ethylcoumarinic and ethylcoumaric acids yield ethylsalicylaldehyde and ethylsalicylic acid on oxidation with potassium permanganate. These acids are both converted into ethylmelilotic acid, $\text{Et O} \cdot \text{C}_6\text{H}_4 \cdot (\text{CH}_2)_2 \cdot \text{COOH}$, by the action of sodium amalgam on their aqueous solutions. The author also finds that the bromide, $\text{C}_{11}\text{H}_{12}\text{Br}_2\text{O}_3$ (m. p. 155°), obtained by the action of bromine on a solution of ethylcoumarinic acid in carbon bisulphide, is identical with the bromine-compound derived from ethylcoumaric acid. This statement does not agree with Perkin's observations.

Coumaric acid stands in the same relation to coumarinic acid that angelic acid bears to tiglic acid.

Cinchonic and Pyrocinchonic Acids. H. Weidel and R. Brix. (*Monatsh. Chem.*, iii. 603–621; and *Journ. Chem. Soc.*, 1882, 1304.) The action of hydrogen on a solution of sodium cinchomerone gives rise to a non-azotised acid (cinchonic acid), the formation of which is attended with elimination of ammonia and assumption of water and hydrogen—



The cinchomeronic acid used in the authors' experiments was prepared according to the method of Hoogewerff and Van Dorp (*Ber.*, xiv. 974), by boiling pyridine-tricarboxylic acid with glacial acetic acid: $\text{C}_5\text{H}_2\text{N}(\text{COOH})_3 = \text{C}_7\text{H}_5\text{NO}_4 + \text{CO}_2$. To convert it into cinchonic acid, solid sodium amalgam is added to a boiling

solution of 60 grams sodium cinchomeronate in 25 litres of water, as long as ammonia continues to escape; the separated mercury is poured off, and the solution is mixed with sulphuric acid in such quantity as to convert about one-fourth of the soda into acid sulphate. On evaporating to dryness, exhausting the residue with absolute alcohol, and distilling off the alcohol, there remains a pale yellow syrup, still containing sulphuric acid and soda, the former of which may be removed by barium carbonate. The concentrated solution of barium cinchonate is then to be precipitated with basic lead acetate, and the precipitate decomposed by hydrogen sulphide, whereby a colourless solution is obtained, which on evaporation leaves the cinchonic acid in the form of a nearly colourless syrup, and this, after long standing over sulphuric acid, solidifies to a soft hygroscopic crystalline mass.

Cinchonic acid, in presence of traces of a mineral acid, changes gradually into a thick oily mass, which requires long boiling with water to reconvert it into the original acid. This alteration, also produced by prolonged heating, is probably due to the formation of an anhydride or lactone.

Barium cinchonate, $C_7H_6BaO_6$, is nearly insoluble in cold, moderately soluble in hot water, and crystallizes with 4 mols. H_2O , which are not given off below 200° . With silver nitrate its solution gives a white pulverulent precipitate of the salt $C_7H_6Ag_2O_6$; with lead acetate, normal or basic, a white precipitate, which when thrown down by basic lead acetate at the boiling heat, changes, like lead malate, into a greasy mass.

Pyrocinchonic anhydride, $C_6H_6O_3$, is formed, together with a small quantity of oily substance, by the dry distillation of cinchonic acid: $C_7H_8O_6 = C_6H_6O_3 + C_2O_2 + H_2O$. After repeated crystallization from ether, it melts at 94.2° ; after sublimation, at 95.1° . From solution in benzene, ether, chloroform, or acetone, it separates in large nacreous rhombic laminæ or tablets, which are especially fine when crystallized from acetone. Axes, $a:b:c = 0.6265:1:1.5208$. Forms $\infty P \bar{\infty}$, $\infty P \infty$, $OP \infty P$. Cleavage basal.

The metallic pyrocinchonates, obtained by boiling pyrocinchonic anhydride with the corresponding carbonates, are microcrystalline salts. The *calcium salt*, $C_6H_6CaO_4$, separates from its solution, by spontaneous evaporation, in chalky microscopic crystalline splinters, and, like the normal butyrate and valerate of calcium, is precipitated from solution at the boiling heat. When submitted to dry distillation, all the pyrocinchonates yield, not the acid $C_6H_8O_4$, but the anhydride $C_6H_6O_3$.

Pyrocinchonimide, $C_6H_6(NH)O_3$, is obtained by heating pyrocinchonic anhydride in a sealed tube at 100° , for two hours, with a concentrated solution of ammonia in absolute alcohol, $C_6H_6O_3 + NH_3 = H_2O + C_6H_7NO_2$, and separates from solution in dilute alcohol in triclinic prisms.

Hydropyrocinchonic acid, $C_6H_{10}O_4$, isomeric with adipic acid, is formed by the action of sodium-amalgam on pyrocinchonic anhydride, according to the equation $C_6H_6O_3 + H_2O + H_2 = C_6H_{10}O_4$, and crystallizes from water in dull white spherical geodes. It is moderately soluble in alcohol, and often separates therefrom in larger needles, having a vitreous lustre and belonging to the triclinic system. When heated, it sublimes in feathery crystals, and melts, after recrystallization from water, at 189° , after sublimation at 186.5° . It appears at the same time to be partly converted into an anhydride, for the acid melted in capillary tubes does not solidify till after twenty-four hours, and then melts at $151-153^\circ$.

The analyses of the normal calcium and acid ammonium salt show that this acid is bibasic. The *calcium salt*, $C_6H_8CaO_4$, is but slightly soluble even in hot water, and separates from concentrated solutions in silky monoclinic needles, containing $1\frac{1}{2}$ mols. H_2O , which they give off only at a very high temperature. The *acid ammonium salt*, $C_6H_9(NH_4)O_4$, forms monoclinic prisms, having a vitreous lustre, and easily soluble in water, either warm or cold. Axes, $a:b:c = 0.768:1:0.605$. Angle $ac = 107^\circ$. Forms, $OP, \frac{1}{2}P \infty, \infty P, \frac{1}{2}P \infty$. Cleavage indistinct.

The conversion of pyrocinchonic anhydride into an acid, $C_6H_{10}O_4$, is likewise effected by the action of hydriodic acid and phosphorus, aided by heat. At the same time, however, a volatile acid is produced, the composition of which has not yet been made out.

Santonous and Isantonous Acids. C. Cannizaro and G. Carnelutti. (*Gazz. Chim. Ital.*, xii. 393-416.) These acids and a number of their derivatives are described in a lengthy paper which is unsuited for abstraction.

Meconic Acid and certain of its Derivatives. E. Memel. (*Journ. für prakt. chem.*, 1882, Part 10.) The author describes the mono-, di-, and tri-ethyl-ethers of meconic acid, ethyl-meconic acid with its lead salt, ethyl-comenic acid with its silver salt; the action of ammonia upon mono-ether-meconic acid, mono-meconamiminic acid; the action of bromine upon meconic acid and its ethers, brom-oxy-brom-komenic acid, and brom-oxy-brom-komenic ether. He concludes from his experiments that meconic acid is a dibasic oxy-

acid, for which view the tri-ethyl-ether and its derivatives, ethyl-meconic and ethyl-comenic acids supply a proof. The hydroxyl of meconic acid is comparable to phenol-hydroxyl. Consequently, the silver salt regarded by Liebig as neutral, is in its composition analogous to the so-called basic sodium salicylate. The compounds which in watery solution have a neutral reaction, and have hitherto been termed mono-acid, are true neutral salts of meconic acid.

Preparation of Succinic Acid from Tartaric Acid. M. F. König. (*Journ. de Pharm. et de Chim.*, Nov., 1882.) Dissolve 2 kilos. tartaric acid in water, neutralize with ammonia, dilute to 30 litres, add to the solution 20 grams potassium phosphate, 10 grams magnesium sulphate, a few grams calcium chloride, and about 20 c.c. of a solution of ammonium tartrate in fermentation, which is easily obtained by letting some of the same liquid stand for some days, diluted with five times its weight of water. By degrees the moisture becomes turbid, and swarms with bacteria. It is then left to itself for six to eight weeks at a temperature of 25° to 30°, covered as well as possible from the air, until the slight escape of gas ceases, and there is no more tartaric acid. It is then evaporated to expel ammonium carbonate, clarified with white of egg and milk of lime, so as to leave the boiling liquid alkaline. When cold the deposit of calcium succinate is pressed and decomposed by sulphuric acid. The liberated succinic acid is purified by the usual means. Two kilos. tartaric acid yield 500 grams succinic acid, the theoretical yield being 524 grams.

Dry Distillation of Tartaric Acid. L. Liebermann. (*Ber. der deutsch. chem. Ges.*, xv. 1428-1434.) The tartaric acid is mixed with powdered glass and distilled; water, carbonic oxide, and anhydride are given off. The distillate is filtered to separate the tarry matter. The filtrate, after slight evaporation, deposits crystals of *pyrotartaric acid*, which are filtered off. The second filtrate is neutralized with lead carbonate, and extracted with ether. *Lead pyruvate* is soon deposited from the aqueous solution. The filtrate from this salt is decomposed with sulphuric acid, filtered, and distilled. The distillate contains *formic* and a small quantity of *acetic acid*. The residue in the retort contains *lactic acid*, recognised by the form of crystallization of the zinc salt. The ethereal extract deposits crystals of lactic anhydride, and leaves on evaporation a resinous residue, which possesses reducing properties, probably due to an aldehyde. 250 grams of tartaric acid yielded 9.24 grams of pyruvic acid; 2.11 grams of pyrotartaric acid; 4 grams of formic

acid; 4.0 grams of tarry matter; 2.0 grams of resin, aldehyde, and volatile acids.

Dry Distillation of Tartaric and Citric Acids with Lime. M. Freydl. (*Monatsh. für Chem.*, iv. 149.) When anhydrous Rochelle salt is distilled with an equal weight of quicklime, it yields an abundance of hydrogen gas and a distillate separating into an oily and an aqueous layer, the latter of which contains acetone, while the oily layer contains a small quantity of benzol.

Similar results are obtained with sodium citrate.

Contribution to the Chemistry of Tartaric and Citric Acids. (*Pharm. Journ.*, 3rd series, xiii. 435, from a paper compiled by R. Warrington, from laboratory notes of the late B. J. Grosjean.)

(1) *On the different Rates of Loss of different Specimens of Citric Acid in Dry Air.*—Three specimens of different samples of citric acid were powdered and placed in two desiccators over fresh oil of vitriol on April 21st, 1880; on May 6th one specimen had lost 0.68 per cent., the second 6.25 per cent., the third 8.55 per cent. On May 15th the first had lost 1.75 per cent., the second 8.55 per cent. On June 21st the first specimen had lost 8.47 per cent. The theoretical amount of moisture present was 8.57 per cent.

(2) *Determination of Citric Acid in Lemon and other Juices.*—The method used by precipitation with CaCl_2 , etc., has already been described (*Chem. Soc. Journ.*, 1875, 931). It appears that the precipitable acid in commercial concentrated lemon juice is, on the average, very nearly equal in quantity to the free acid present. Thus, in sixty-five analyses, representing 895 pipes, the precipitated acid averaged 99.2 per cent. of the free acid. Some exceptional samples gave numbers from 85.8 per cent. to 103.6 per cent. In bergamot juice the average number from ninety pipes was 98.4 per cent.; in lime juice, 91 to 92 per cent. In orange juice about 68.5 per cent. of the free acid was found to be precipitable. Thus, while the determination of the free acid gives trustworthy results with lemon juice, it furnishes with lime and orange juice a very unsafe guide to the quantity of citric acid present.

(3) *Influence of Heat on Solutions of Tartaric Acid.*—Forty grams of tartaric acid were dissolved in water and concentrated till a crust formed. The acidity was now reduced to 97.9 per cent. of the original acid, while the orthotartaric acid, precipitated by potassium citrate, was only 74.6 per cent. On diluting and boiling for two hours the solution gave 99.0 per cent. free acidity, and 99.9 per cent. orthotartaric acid. The metatartaric acid, formed as above, is also slowly reconverted into orthotartaric acid by standing in

dilute solution at the ordinary temperature. Thus, the percentage of orthotartaric acid in the above solution increased after standing two months from 74.6 to 90.0.

(4) *Influence of Sulphuric Acid on the Crystallization of Tartaric Acid.*—Sulphuric acid considerably diminishes the solubility of tartaric acid. Much more tartaric acid crystallizes out from a saturated solution in dilute sulphuric acid, than from a hot saturated aqueous solution; the latter deposits only 50 per cent. of its tartaric acid on cooling, whilst a hot solution in 1 volume of water and $1\frac{1}{2}$ volume of oil of vitriol deposits 70 per cent. of its tartaric acid.

(5) *Actions of Solutions of Potassium and Sodium Sulphates on Calcium Tartrate.*—In the ordinary manufacture of tartaric acid, moist gypsum is added to decompose neutral tartrate of potash and precipitate calcium tartrate; under certain conditions this reaction is reversed, and if the solutions of potassium or sodium sulphate be sufficiently strong, practically the whole of the tartaric acid in calcium tartrate may be brought into solution as potassium or sodium tartrate.

(6) *Destruction of Citrates and Tartrates by Peroxide of Hydrogen.*

(7) *Destruction of Neutral Tartrates when their Solutions are heated with Iron Salts.*

(8) *Determination of Free Sulphuric Acid in Tartaric Acid Liquors.*—To ascertain when enough sulphuric acid has been added to decompose the calcium tartrate, the workman usually adds a few drops of calcium chloride solution; if a precipitate appears in a few minutes, free sulphuric acid is present. It is proved in the present paper that this test, with certain precautions as to time and dilution may be used quantitatively.

(9) *Determination of Tartaric Acid by Precipitation as Acid Potassium Tartrate.*—The ordinary method consists in the precipitation of tartaric acid with an excess of potassium citrate, washing the precipitated bitartrate with a 5 per cent. solution of potassium chloride saturated with bitartrate, and determining by titration the acidity of the precipitate. This method is subject to two errors, one of excess due to the precipitation of an acid citrate, and one of deficiency due to the solubility of bitartrate in solutions of citric acid and potassium citrate. The author concludes that in all accurate determinations it is necessary to make preliminary experiments with graduated quantities of potassium citrate, to discover the proportion which gives a precipitate of maximum acidity. This being ascertained, a final determination is made with this quantity, the precipitate thoroughly washed, and its acidity deter-

mined. If much sulphuric acid is present, the result is usually about 1 per cent. in excess of the truth.

(10) *Detection of Tartaric Acid in the presence of Citric Acid.*—Cailletet's bichromate test (*Chem. Soc. Journ. Abstracts*, 1879, 674) gives satisfactory results.

(11) *Determination of Organic Acids from the Neutralizing capacity of the Ash of the Salts.*—With potassium or sodium salts the ignition must be effected by a spirit lamp, *i.e.*, at a low temperature, to avoid loss.

(12) *Standardizing of Alkali used in Titration.*—The best material for this purpose is acid potassium tartrate; it is easily prepared pure, can be dried at 100°, is not hygroscopic, and being of low acidity a large weight can be taken.

Ammoniacal Citrates. E. Landrin. (*Ann. Chim. Phys.* [5], xxv. 233. From *Pharm. Journ.*) It is well known that many metallic oxides and citrates, insoluble in water, are soluble in the alkaline citrates, even in the presence of reagents which under ordinary conditions precipitate these oxides. This phenomenon has been made the basis of a quantitative method for the determination of phosphoric acid. Some years ago, Spiller (*Pharm. Journ.*, 1858) carried on a series of investigations, in order to study the influence of citric acid in preventing the precipitation of the metallic oxides, and arrived at the general result that the neutral citrates possess the property of combining with other salts to form a class of compounds of the general formula, $M'_3 C_6 H_5 O_7 + 3 M'_2 S O_4$, in which sulphuric acid may be replaced by carbonic, chromic, or boracic acids. For instance, solutions of these compounds are not precipitated by barium nitrate until a slight excess of sodium sulphate is present. Lebaigue (1864), however, considers that these phenomena are due to an interchange between the acids and bases, which is stable only so long as the citrate liberated in the nascent state is soluble, and thus the peculiar characteristics of the acids and bases present become apparent when the nascent citrate has saturated the alkaline citrate, *viz.*, when the precipitate is in excess of the alkaline citrate. Further, the insoluble citrates are dissolved in the alkaline citrate in definite proportions, and citric acid being tribasic can saturate not only three equivalents of the same, but also of different bases to form soluble salts.

In order to decide between these views, the author has taken up the question, and has arrived at results in accordance with those of Lebaigue, *i.e.*, citrates insoluble in water dissolve in alkaline citrates, with formation of double salts of the composition $M_2 M' C_6 H_6 O_7$,

in which M is an alkali-metal, and M' a metal belonging to some other class.

This result receives support from the following experiments:— If barium carbonate is gradually added to citric acid saturated with ammonia until one equivalent of acid and baryta are present, a clear solution is obtained, from which, on cooling, normal barium citrate separates out. The supernatant liquid contains in solution a double ammonium barium citrate. Analogous phenomena were observed with the oxides of calcium, strontium, lead, and cadmium. Again, if aluminium hydroxide be dissolved in ammonium citrate, and the solution evaporated over sulphuric acid, white crystals of a double ammonium aluminium citrate, $3\text{C}_6\text{H}_5\text{O}_7(\text{NH}_4)_2\text{H} + [\text{C}_6\text{H}_5\text{O}_7(\text{NH}_4)_2]_3\text{Al}_2 + 6\text{H}_2\text{O}$, will separate out. A similar iron salt was obtained, a solution of which gives no precipitate with succinic and benzoic acids, no coloration with potassium thiocyanide, and no precipitate, but only a green coloration with potassium ferrocyanide. The author also prepared and analysed analogous double citrates of ammonium and magnesium, manganese, nickel, cobalt, zinc, copper, and mercury, but was unable to obtain salts of antimony, bismuth, tin, or silver.

Synthesis of Oxalic Acid. V. Merz and W. Weith. (*Ber. der deutsch. chem. Ges.*, xv. 1507–1513, and *Journ. Chem. Soc.*, 1882, 1049.) The authors have investigated the conversion, under varying conditions, of the formates of the alkalis and alkaline earths into oxalates. Sodium formate, when heated over a naked flame, melts at first to a limpid liquid, which, on continuing to raise the temperature, froths considerably, from evolution of hydrogen, becoming viscous, and ultimately solidifying to a crystalline mass. If the liquid is continually stirred, a homogeneous mass is obtained, which, in one experiment, the authors found to contain: $\text{Na}_2\text{C}_2\text{O}_4$, 50·4 per cent.; Na_2CO_3 , 13 per cent. On the other hand, if the heating is unaccompanied by stirring, the product contains two layers; the upper white, the lower dark-coloured. The mean percentage of the salts in this case was found in one experiment to be $\text{Na}_2\text{C}_2\text{O}_4$, 21 per cent.; Na_2CO_3 , 14·5 per cent.

The subsequent experiments were conducted in a glass tube, 15–20 mm. in diameter, terminating in a bulb at its lower end, and contained within a second tube of 45–50 mm. diameter, partly filled with a liquid, which could be heated to the temperature required, and served as the bath for heating the former. The liquids used were diphenylamine, mercury, and sulphur. The results of the experiments were as follows:—

Sodium Formate.

No.	Temp.	Duration.	Atmosphere.	Product contained :	
				Na ₂ C ₂ O ₄ per cent.	Na ₂ C O ₃ per cent.
1	310°	5 hrs.	Air	·0	traces
2	360°	"	"	20·8	56·5
3	"	"	Partial vacuum	27·9	54·4
4	"	"	C O ₂	7·1	50·9
5	420°	50 min.	Partial vacuum	54·4	37·8
6	"	"	"	52·7	—
7	"	"	"	71·6	28·7
8	"	"	"	72·1	28·1
9	"	1 hr.	Air	37·8	59·5
10	"	"	Stream of air	29·6	—
11	"	"	Partial vacuum	52·8	—
12	"	"	"	75·2	—
13	"	"	Hydrogen	54·6	—
14	"	"	C O ₂	29·5	59·2

The conditions most favourable to the formation of oxalate are a partial atmosphere of air, and a rapid application of heat.

Potassium Formate.

No.	Temp.	Duration.	Atmosphere.	Product contained :	
				K ₂ C ₂ O ₄ per cent.	K ₂ C O ₃ per cent.
1	360°	5 hrs.	Air	·0	41·3
2	"	10 hrs.	"	·0	93·3
3	"	5 hrs.	Partial vacuum	·0	35·1
4	420°	1 hr.	Air	43·0	56·6
5	"	"	Partial vacuum	66·7	31·8
6	"	"	C O ₂	20·7	—

Rubidium formate at 360° is decomposed in a similar manner, but more slowly than the potassium salt, carbonate being formed, but no oxalate.

Calcium formate is only slowly decomposed at 360°. After heating for five hours in one experiment, the mass was found to contain 5 per cent. Ca C O₃, but no oxalate. In the sulphur bath (440°) the decomposition was more rapid. At the expiration of one hour, in one experiment, the mass was found to contain 54·5 per cent. Ca C O₃, and 0·5 per cent. of a carbonaceous residue, but no oxalate.

Barium formate was decomposed gradually at 360° . After the expiration of five hours, the resulting mass contained 85 per cent. BaCO_3 . In a partial vacuum, at the same temperature, the percentage of carbonate formed in the same time was 39. No oxalate was formed either at this temperature or at 440° .

Magnesium formate is decomposed slowly at 360° , but without formation of oxalate. After five hours' heating in one experiment, the mass contained 16.1 per cent. carbonate.

Conversion of Oxalates into Carbonates.—The alkaline oxalates were found to be only slightly decomposed at the temperature of the sulphur bath. After five hours' heating, the mass contained, in the case of the sodium salt, 5 per cent. Na_2CO_3 ; in the case of the potassium salt, 3.95 per cent. K_2CO_3 .

The gas evolved during the decomposition of the oxalate is not pure carbonic oxide, but a mixture of carbonic anhydride and monoxide. According to the author's experiments upon dipotassic oxalate, perfectly dehydrated and heated in an atmosphere of nitrogen, the ratio (volumes) varies from 1 : 11 to 1 : 14.5.

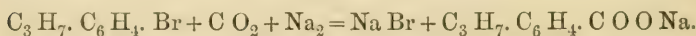
Sodium formate, heated at 420° , is largely converted into oxalate, the yield amounting to 70–75 per cent. of the resulting mass. Moreover, the synthesis of the formate from carbon monoxide and sodium hydroxide, *i.e.*, soda-lime, offers no difficulties; and the separation of the disodic oxalate, formed from the formate, is easily effected by recrystallization from hot water. The yield of oxalic acid in the ordinary process of fusing sawdust with a mixture of sodium and potassium hydroxide, does not exceed 50 per cent. of the weight of the latter. The yield from the formate, calculated from the composition of the product, *i.e.*, containing 60–70 per cent. oxalate, is much higher, with the additional advantages of involving the exclusive use of the cheaper alkali, and furnishing a product of a high degree of purity. The authors leave it to the technologists to decide as to the employment of the process on the large scale.

Synthesis of Cuminic Acid. R. Meyer and E. Müller. (*Ber. der deutsch. chem. Ges.*, xv. 1903–1906.) The authors have repeated their synthesis of cuminic acid (*Ber.*, xv. 496) on a larger scale, with the view of examining the cause of discrepancy between the melting point (110°) of their synthesised acid and that (116°) of ordinary cuminic acid. The cumene was prepared by the action of isopropyl bromide on benzene in the presence of aluminium bromide, then converted into parabromocumene, and this, after careful purification, was submitted to the action of sodium and moist carbonic anhydride. The acid obtained in this way differed from that previously

prepared, in having the correct melting point ($116-117^{\circ}$), and it agreed in all respects with ordinary cumic acid. Since both the para-propyl-benzoic acids have now been made synthetically by similar reactions, there can be no further doubt of their constitution—cumic acid containing the isopropyl group, and its isomeride, normal propyl.

An attempt to prepare propylbenzoic acid by the action of sodium amalgam on para-propylbenzene and chlorocarbonic ether did not yield very definite results; for although a small quantity of propylbenzoic acid appeared to be formed, the chief product of the reaction was a new body of the formula, $\text{Hg}(\text{C}_6\text{H}_4.\text{C}_3\text{H}_7)_2$ [$\text{Hg}:\text{C}_3\text{H}_7=1:4$] (m. p. 109°).

Constitution of Cumic Acid. R. Meyer and E. Müller. (*Ber. der deutsch. Chem. Ges.*, xv. 496–498.) The constitution of cymene is now well understood, and several of its para-derivatives have been synthesised; there is, however, a doubt still surrounding the constitution of cumic acid. The authors make the solution of this question the subject of their experiments; and the way they propose to solve it is to synthesise both cumic acid and the isomeric para-acid by the same method. The theory of the method adopted (Kekulé's reaction) is thus represented:



The cymene employed was obtained by distilling cumic acid with lime; this was brominated by Jacobsen's method. The bromine-derivative, after purification by treatment with alcoholic potash, distillation with steam, and rectification, is mixed with a large excess of benzene, $1\frac{1}{2}$ times the theoretical quantity of sodium is added, and a current of damp carbonic anhydride passed through for forty-eight hours, the whole being heated on a water-bath during the operation. From the product a cumic acid is separated melting at 110° .

Solubility of Sodium Benzoate in Alcohol. Dr. H. Hager. (*Pharmaceut. Centrallhalle* [N. F.], ii. 435.) It has been stated that the solubility of the sodium salt of benzoic acid in alcohol varies with the source of the acid (benzoin, urine, phthallie acid, etc.) from which the salt was prepared. The author has convinced himself that no such difference in the solubility exists, 1 part of the salt being soluble in 13 parts of alcohol of 90 per cent., irrespective of the source of the benzoic acid contained in it.

Solubility of Cream of Tartar in Water at Different Temperatures.
 C. v. Babo and C. Portelle. (*Zeitschr. des Oesterr. Apoth. Ver.*,
 xix. 265.) The author's results are tabulated as follows:—

Temperature.	Grams of Tartar contained in 100 c.c. of Solution.	Grams of Tartar dissolved in 100 c.c. of Water.
0·0°	0·370	0·37
0·5	0·345	—
3·0	0·365	—
9·2	0·367	—
10·0	0·376	—
15·0	0·411	0·411
17·0	0·492	—
19·0	0·597	—
22·4	0·787	—
25·0	0·843	0·845
30·0	1·020	1·024
34·9	1·281	—
40·0	1·450	1·461
50·0	1·931	1·954
60·5	2·475	—
69·0	3·160	—
75·0	3·580	—
80·0	4·050	4·166
95·4	5·325	—
100·0	5·850	6·102

Specific Gravities of Solutions of Tartar Emetic of Various Strengths. G. Streit. (*Dingl. polyt. Journ.*, ccxxxix. 168.)

Specific Gravity at 17° C.	Percentage of Tartar Emetic.
1·005	0·5
1·007	1·0
1·009	1·5
1·012	2·0
1·015	2·5
1·018	3·0
1·022	3·5
1·027	4·0
1·031	4·5
1·035	5·0
1·038	5·5
1·041	6·0

New Derivatives of Salicylaldehyde. H. Voswinckel. (*Ber. der deutsch. chem. Ges.*, xv. 2021–2027; *Journ. Chem. Soc.*, 1883, 189.) Tiemann and Reimer have shown (*Ber.*, ix. 1268; x. 1562) that, by the chloroform reaction, salicylic acid yields both

para- and ortho-aldehydosalicylic acids, but parahydroxybenzoic acid only one product, namely orthoaldehydosalicylic acid. Applying the same reaction to salicylic and parahydroxybenzaldehydes, the author has obtained analogous results. In the former case two bodies are formed, the one easily, the other sparingly, soluble in light petroleum. The former, *α*-hydroxyisophthalaldehyde, $C_6H_5(OH)(COH)_2[OH:COH:COH=1:2:6]$, crystallizes from water in tufts of needles melting at 88° , the latter *β*-hydroxyisophthalaldehyde, $C_6H_5(OH)(COH)_2[OH:COH:COH=1:2:4]$, in long needles melting at 108° . When parahydroxybenzaldehyde is used, only one body is formed, namely, the *α*-compound.

The constitution of these dialdehydes is determined by fusing them with potash, whereby they are converted into *hydroxyisophthalic acid*. Attempts to form bodies containing a third COH group proved fruitless.

Methylsalicylaldehyde.—The author finds that the reaction between the sodium compound of salicylaldehyde and methyl iodide is completed by digestion on the water-bath. By removing every trace of salicylaldehyde, the methyl-derivative is obtained in prisms melting at 35° .

Salicylaldehyde cyanhydrin, $C_6H_4(OMe)[CH(OH).CN][1:2]$.—This compound is easily obtained by the action of potassic cyanide and hydrochloric on salicylaldehyde dissolved in ether. It separates from benzene in colourless transparent crystals melting at 71° . Attempts to obtain the corresponding amide were unsuccessful, and *orthomethoxymandelic acid* was obtained only as a syrup in an impure condition. By the action of the equivalent quantity of a 10 per cent. solution of ammonia in closed vessels at $60-70^\circ$, the compound $(OMe.C_6H_4.CH.CN)_2N_2H$, is produced. It melts when freshly prepared at 123° , but soon alters on exposure to air.

Nitrite of orthomethoxyphenylphenamidoacetic acid, $C_6H_4(OMe)[CH(NHPh).CN][1:2]$.—This body is easily obtained by the action of aniline on the cyanhydrin of methylsalicylaldehyde. It forms colourless six-sided tables melting at 61° .

Nitromethylsalicylaldehyde, $C_6H_3(NO_2)(OMe).COH$.—The author has prepared this compound by dissolving the aldehyde in fuming nitric acid, and precipitating by water. It forms fine white needles melting at 88° . The author is engaged in investigating its constitution.

Aqueous Solutions of Salicylic Acid. W. Alexejeff. (*Journ. für pract. Chem.* [2], xxv. 518-521.) Solutions of the acid are

obtained by heating the acid with water in closed tubes slightly above 100° . When they are cooled quickly the whole becomes a crystalline magma, but when they are cooled slowly, peculiar results are obtained, the acid separating sometimes as an oil and sometimes in crystals. A few examples of these results are given: solutions containing 73.01 and 66.71 per cent. of the acid solidify suddenly at 68° and 67° respectively; whilst those containing 61.2, 42.90 to 21.20, or 4.57, become turbid at 76° , 90.5° , or 63° , and deposit the acid as an oil: solutions containing 2.96 per cent. become turbid at 49° , and the acid separates in crystals: solutions made at 12.5° contain 0.16 per cent. of salicylic acid; at 66° , 1.27 per cent.; at 81° , 2.44 per cent.; at 100° , 8.67 per cent. From these facts the author infers that there are three different kinds of solutions, viz.: 1st, solutions of water in salicylic acid; 2nd, solutions of the acid in water, which deposit, on cooling, the "liquid acid"; 3rd, solutions of the acid in water depositing, under similar conditions, crystals of the acid. The "liquid acid" is an example of the 1st kind, and the supernatant liquid, which is highly refractive, of the 2nd or 3rd; for the same solution may be classed in either one of these according to the temperature at which it is prepared, inasmuch as all solutions made below 100° contain the "solid acid," whilst those made above 100° contain the "liquid acid."

Sulpho-Carbolates. Dr. H. P. Farnham. (*New Remedies*, 1883. 39.) The author calls attention to the fact that the sulphocarbolates met with in commerce vary much in purity, some specimens that he had met with producing vomiting and prostration when taken internally. These specimens were not of English manufacture, the only satisfactory samples that he could obtain being prepared by one of the leading chemical firms in England. Dr. Farnham gives as a test for the purity and safety of the sulphocarbolates, that they should give off scarcely any odour of carbolic acid, should have a definite crystalline form, and should give no precipitate with chloride of barium. In other words, they should not contain free carbolic or sulphuric acid, and a preparation offered in the form of an amorphous powder should not be used. The pure salt also makes a perfectly clear solution in water, but the impure a muddy one.

Compounds of Phenol with Carbonic and Sulphurous Anhydrides. A. Klepland and A. Holzer. (*Journ. pract. Chem.* [2], xxv. 462-464.) By heating salicylic acid, paroxybenzoic acid, or a mixture of the two, at 260° for two hours, they are decomposed into phenol and carbonic anhydride. During cooling the contents of the tube solidify in crystals resembling pyramids, with step-like faces of

common salt. These crystals melt at 37° . On opening the tubes much carbonic anhydride is evolved, and the crystals become white and opaque. On gently heating, or on covering with alcohol, ether, chloroform, or water, carbonic anhydride is copiously evolved and phenol remains.

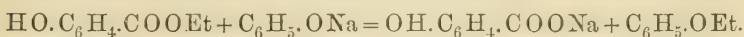
The compound with sulphurous anhydride is prepared by heating sodium phenylate in sulphurous anhydride, or by passing the latter into dry phenol and distilling, when a yellow oil passes over at 140° , solidifying on cooling to large well-formed rhombic tables. It melts at $25-30^{\circ}$ if precautions are taken to prevent loss of sulphurous anhydride. It readily loses sulphurous anhydride in a vacuum or on exposure to air, and is decomposed by heating in a stream of carbonic anhydride, whilst in a stream of sulphurous anhydride it can be distilled through tubes heated to dull redness without suffering much decomposition. The analytical results, although not very accordant, owing to the instability of the substance, show a compound of 1 mol. of sulphurous anhydride with 4-5 mols. of phenol.

Conversion of Phenyl Ethers of Carbonic Acid into Salicylic Acid. W. Hentschel. (*Journ. für. pract. Chem.*, xxvii. 39-45; *Journ. Chem. Soc.*, 1883, 588.) The author shows that when sodium-phenol is acted on by carbonic anhydride, sodium phenyl carbonate is first formed; and in presence of another molecule of sodium-phenol this is decomposed with formation of the sodium salt of salicylic acid. The intermediate product is best prepared by passing dry carbonic anhydride into a solution of sodium phenol in absolute alcohol; the resulting body is a mixture of equal parts of ethyl and phenyl sodium carbonate. When heated with sodium-phenol it yields salicylic acid.

The author has prepared phenyl sodium carbonate in large quantities by passing carbonyl chloride into an aqueous solution of sodium phenol. After purification, it was obtained as a white crystalline mass which distilled at $301-302^{\circ}$. The mode of preparation is of general application. The author has likewise prepared the orthonitrophenyl-compound, which crystallizes from alcohol in silky rhombic plates.

Ethyl phenyl carbonate, obtained by the action of ethyl chloroformate on potassium-phenol, can also be converted into salicylic acid. Analogous methods of preparation yield a series of substituted ethyl ethers of phenyl-carbonate. A parachlorophenyl, a tribrominated, an orthonitro-ether of phenyl carbonate, and finally the corresponding thymol compounds, have been obtained.

Conversion of Ethyl Phenyl Carbonate into Salicylic Acid.—On heating ethyl phenyl carbonate with sodium-phenol in equivalent proportions, the following reaction takes place:—



The author considers that carbonic anhydride in this case exerts first an etherifying action on sodium-phenol, and that the phenyl sodium carbonate thus formed only yields salicylic acid on coming into contact with a second mol. of sodium-phenol. In Kolbe's process, it is possible that the conversion of the phenyl salt into salicylic acid might be produced by some other method, such as warming. The author was unable to obtain salicylic acid by digesting ethyl phenyl carbonate, or diphenyl carbonate, with sodium or an alcoholic solution of sodium.

The Conversion of Diphenyl Carbonate into Salicylic Acid is best performed by distilling the salt with dry sodium ethylate in a current of hydrogen gas. The reaction,



takes place. When distilled with sodium hydroxide, the diphenyl carbonate yields sodium salicylate and phenol. The reaction proceeds so readily that the author suggests the possibility of a commercial process being made out of it.

New Nitro-Derivatives of Phenol. R. Henriqués. (*Liebig's Annalen*, ccxv. 321-344; *Journ. Chem. Soc.*, 1883, 327.) So far no isomerides of picric acid have been obtained; Bantlin stated that he had prepared isopicric acid by boiling the dinitrophenols obtained from metanitrophenol with nitric acid; but he found later that the substance was trinitroresorcinol (styphnic acid). The author has re-investigated this reaction, and succeeded in obtaining two new trinitrophenols.

γ -Dinitrophenol is dissolved in three times its weight of concentrated nitric acid in the cold, and the solution, after standing for thirty-six to forty-eight hours, is poured into water, when an oily mixture separates; the free nitric acid is neutralized with ammonia, and the nitrophenols are extracted with ether. The ethereal solution is evaporated to dryness and treated with steam to remove unaltered dinitrophenol; the residue is dissolved in water, treated with barium carbonate, and evaporated to dryness; and the barium derivatives are treated with absolute alcohol. The residue then consists of barium styphnate, together with a small quantity of the barium salt of a tetranitrodihydroxybenzene (see later). The alcoholic

solution contains the barium salts of β - and γ -trinitrophenol, which can be separated by fractional crystallization. The yield of the trinitrophenols is only about one-sixth of the dinitrophenol employed.

Bantlin concluded that γ -dinitrophenol had the constitution $[\text{OH} : \text{N O}_2 : \text{N O}_2 = 1 : 2 : 5]$. As this, however, is in contradiction to its ready conversion into trinitroresorcinol, in which the two OH groups are known to be in the meta-position, the author has reinvestigated the question. γ -Dinitrophenol was heated for a short time at 100° with methyl iodide and methyl alcohol, when the anisoil of melting point 96° was obtained. This was heated with alcoholic ammonia at 200 – 210° ; the resulting dinitraniline, on treatment with ethyl nitrite, gave a readily sublimable mass of m. p. 170° . (Paradinitrobenzene melts at 171 – 172° , whilst metadinitrobenzene, which should have been formed according to Bantlin's hypothesis, melts at 90° .) From this it is evident that the constitution of γ -dinitrophenol would be $[1 : 3 : 6]$ (OH in 1).

The nitration of ϵ -dinitrophenol $[1 : 2 : 3]$ is best effected by adding it to well-cooled nitric acid, and, after two or three hours, pouring into water, the subsequent treatment being similar to that given for the γ -compound. It yields trinitroresorcinol and γ -trinitrophenol.

δ -Dinitrophenol $[1 : 3 : 4]$ yields on nitration trinitroresorcinol, β -trinitrophenol, and possibly another trinitrophenol in small quantity, as after the treatment with ammonia the aqueous solution was found to contain a dinitramidophenol, apparently not derived from β -trinitrophenol.

The new trinitrophenols closely resemble picric acid; they have a bitter taste, readily decompose carbonates, detonate on heating, yield explosive salts, and give crystalline compounds with some hydrocarbons.

β -Trinitrophenol, $\text{C}_6\text{H}_2(\text{N O}_2)_3 \cdot \text{O H}$ (m. p. 96° uncorr.), being derived from both δ - and γ -dinitrophenols, must have the constitution $[1 : 3 : 4 : 6]$ (OH in 1). It crystallizes in white satiny needles or plates, is very soluble in alcohol, ether, and benzene, moderately soluble in hot water, sparingly in cold water and dilute acids. The barium derivative, $[\text{C}_6\text{H}_2(\text{N O}_2)_3 \text{O}]_2 \text{Ba} + 4 \text{H}_2\text{O}$, crystallizes in reddish brown prisms, and only completely loses its water on long continued heating at 150° ; it is moderately soluble in water and alcohol. The potassium derivative forms anhydrous, brilliant, clear red crystals of violet reflex; it is sparingly soluble in water, nearly insoluble in alcohol. Solutions of the salts of β -trinitrophenol give a yellow precipitate with lead salts, which can be obtained crystallized

in needles, and a reddish brown flocculent precipitate with silver salts. On gently heating it with nitric acid, β -trinitrophenol is converted into trinitroresorcinol.

Naphthalene unites with β -trinitrophenol, giving a compound of the formula $C_{10}H_8, C_6H_2(NO)_3.OH$; it crystallizes in yellow needles, which melt at $72-73^\circ$, and are readily soluble in alcohol. Phenanthrene does not yield a similar compound.

γ -Trinitrophenol is obtained from γ - and ϵ -dinitrophenol, and therefore has the constitution $[1:2:3:6]$. It crystallizes in white needles (m. p. $117-118^\circ$), behaves towards solvents like β -trinitrophenol, and is also converted into trinitroresorcinol on oxidation with nitric acid. The *barium* derivative, $[C_6H_2(NO_2)_3O]_2Ba$, crystallizes in clear brown to golden yellow scales, frequently unites in rosettes; it is not very soluble in water or alcohol. (In the preparation of γ -trinitrophenol from ϵ -dinitrophenol, barium salts were obtained in small quantity, crystallizing with 1 and 3 mols. H_2O ; but all attempts to prepare such hydrates from the anhydrous barium salt were unsuccessful.) The potassium salt crystallizes in deep red anhydrous needles, readily soluble in water with red colour, nearly insoluble in alcohol; the aqueous solution dyes wool and silk of an orange colour. Solutions of γ -trinitrophenol salts give a dark yellow precipitate with lead salts; a reddish brown flocculent precipitate with silver salts, and no precipitate with copper or mercuric salts. With naphthalene, a compound, of the formula $C_{10}H_8, C_6H_2(NO_2)_3.OH$, is obtained in golden yellow needles which melt at 100° .

β -Dinitroamidophenol, $C_6H_2(NO_2)_2(NH_2).OH$, isomeric with picramic acid, is obtained, as previously described, by treating the trinitrophenols from δ -dinitrophenol with aqueous ammonia; it crystallizes in brilliant red needles melting at 202° and subliming readily. It is nearly insoluble in ether, water, and mineral acids, sparingly soluble in absolute alcohol, but dissolves readily in solutions of alkalis or alkaline earths, with formation of salts. The *potassium* derivative crystallizes in clear yellow needles readily soluble in water; it explodes feebly on heating.

Tetranitrodihydroxybenzene, $C_6(NO_2)_4(OH)_2$, obtained in small quantity in the nitration of γ -dinitrophenol, crystallizes in yellowish or colourless needles, which melt at 166° , and are readily soluble in alcohol and ether, sparingly in water. The barium derivative, $C_6(NO_2)_4O_2Ba + 6H_2O$, crystallizes in golden yellow silky needles; when anhydrous it acquires a cherry-red colour. It is sparingly soluble in water, insoluble in alcohol.

The constitution of styphnic acid is also settled by these experiments. It has long been known to be a resorcinol derivative, and being formed by the oxidation of both β - and γ -trinitrophenol, it must have the constitution $[\text{OH} : \text{NO}_2 : \text{OH} : \text{NO}_2 : \text{NO}_2 = 1 : 2 : 3 : 4 : 5]$.

Condensation-products of Phenols and Acetic Acid, and a Simple Method for the Preparation of the Ethereal Salts of Phenols. F. Rasinski. (*Journ. für pract. Chem.* [2], xxvi. 53-66, and *Journ. Chem. Soc.*, 1882, 1288.) This work is a continuation of Nencki and Sieber's researches. Gallacetophenone gives rise to a colouring matter when heated with zinc chloride, in the same way that resacetophenone does. This colouring matter dissolves in acids with a yellow, and in alkalies with a violet, colour; it is extremely unstable. The alkaline solution, like that of pyrogallol, turns brown in the air. *Phenacetein*, $\text{C}_{16}\text{H}_{12}\text{O}_2$, is prepared by boiling together phenol (10 grams), acetic anhydride (20 grams), and zinc chloride (20 grams) for 20-30 minutes; the product is well washed with water, dissolved in dilute hydrochloric acid, and as soon as the resinous matter is deposited, the solution is filtered and the colouring matter precipitated by ammonia. It is an amorphous carmine-red powder, easily soluble in alcohol, ether, glacial acetic acid, and alkalies, less so in chloroform and carbon bisulphide, and insoluble in water and benzene. The acid solution is yellow, the alkaline raspberry-red: the colour is fugitive. With acetic anhydride, phenacetein forms an *acetate*, crystallizing in dark red prisms, soluble in alcohol and glacial acetic acid with a green colour. *Orcacetein*, $\text{C}_{18}\text{H}_{16}\text{O}_4$, is obtained when arcinol (10 grams), glacial acetic acid (15 grams), and zinc chloride (20 grams) are heated to the boiling point of the mixture. The product is washed well with water and dissolved in dilute alcohol. A small quantity of some yellow prisms of a homologue of acetofluorescein are deposited from the solution. The chief product remains dissolved, and the filtered solution, after being evaporated, is treated with ethyl acetate, ether is added, and the resinous precipitate is filtered off: the residue left on evaporating the ethereal solution is washed with dilute ammonia, dissolved in potash, and precipitated with hydrochloric acid. Orcacetein is a yellow amorphous powder, easily soluble in ether, alcohol, and glacial acetic acid, sparingly so in chloroform, carbon bisulphide, and dilute ammonia, and insoluble in water and benzene. Its alkaline solutions are yellow, with slight green fluorescence. Orcacetein does not yield a crystalline acetate with acetic anhydride, but resacetein under similar circumstances yields a *resacetein tri-*

acetate, $C_{16}H_9Ac_3O_4$, crystallizing from glacial acetic acid in red tables with golden lustre (m. p. calc. 229°), not soluble in alkalies without decomposition. When phosphorus oxychloride is added to a solution of orcinol in glacial acetic acid, the product poured into water, decomposed by boiling with dilute alkali, and the solution filtered, the addition of hydrochloric acid precipitates a substance crystallizing in silky needles (m. p. 146°), easily soluble in alkalies, alcohol, ether, and glacial acetic acid, less so in water, benzene, and carbon bisulphide. Ferric chloride colours the aqueous solution deep black, which on boiling disappears with formation of a brown precipitate. This substance is probably *orcinyll monacetate*, $C_7H_7AcO_2$. At the same time small quantities of *orcacetophenone*, $C_9H_{10}O_3$ (b. p. $284-286^\circ$), are produced. By boiling orcinol with acetic anhydride, *orcinyll diacetate*, $C_7H_6(\bar{Ac}O)_2$, is obtained, boiling at $280-284^\circ$. The reaction with phosphorus oxychloride shows that, in the presence of this reagent phenols can combine with acids, with elimination of water and formation of acid ethereal salts; it is therefore a general reaction. *Phenyl benzoate* can be prepared by adding phosphorus oxychloride to a fused mixture of benzoic acid and phenol heated to between $106-120^\circ$, as long as hydrochloric acid is evolved. It is purified by washing with dilute potash and crystallizing from alcohol. Its properties, etc. (m. p. 69°) are those given by Malin (*Annalen*, cxxxvii. 78) and Doebner (*Ber. der deutsch. chem. Ges.*, xiii. 2222).

By this method the following substances have been prepared:—*Phenol succinate*, $PhO.Su.PhO$ (m. p. 119°); *resorcinyll benzoate* (m. p. 117°), and *succinate* (the author could not prepare fluoresceine and eosine succinates from this ethereal salt); *orcinyll benzoate* (m. p. 88°), *succinate*, and *oxalate*. From anhydrous ethyl alcohol, a yellowish red liquid, lighter than water, with an odour of phenetol. Corresponding ethereal salts are obtained from glycerol and acetic and benzoic acids, also from glycerol and phenol.

Creasote from Beechwood Tar. A. Grätzel. (*Archiv der Pharm.* [3], xx. 605-610; *Journ. Chem. Soc.*, 1883, 393). This substance, discovered by Reichenbach, and highly esteemed for its medicinal properties, is not a simple body, but a mixture of numerous homologous phenols—guaiacol (b. p. 200°), creosol (b. p. 219°) and small proportions of products boiling at about 232° , and resembling the others in their reactions; the proportions in which they exist are variable, and in great measure dependent on the quality of the tar employed, which in turn varies according to the treatment given to the timber in the wood-vinegar factories where

it is produced. The rough creasote, in addition to pyrogallie dimethyl ether and methylpyrogallie dimethyl ether examined and described by Hofmann, contains another substance, recently isolated by the author and named by him *cœrulignol*.

This possesses so strong and dangerously astringent properties that a single drop on the tongue causes bleeding; creasote must therefore be absolutely freed from it; its absence can be very accurately known by the barium hydroxide test.

Beechwood tar creasote, boiling between 195° and 235° , is of a wine-yellow colour; in flasks of large diameter it is of a deep yellow, similar in appearance to a solution of potassium dichromate, and, if pure, should possess the following properties:—

1. The addition of an equal measure of saturated solution of soda should leave the mixture quite clear, or at most with the yellow colour described, and the addition of 10 to 20 times the bulk of distilled water should not cause any opacity; if there is opacity, it is caused by the presence of lime in the water, or the presence of *cœrulignol*, or some neutral oil.

2. Its aqueous solution, when treated with aqueous solution of ferric chloride, should give a blue colour, rapidly passing into brown.

3. From aqueous solutions, zinc chloride should throw down a white precipitate, soluble in excess of the reagent.

4. Mixed with an equal quantity of glycerol of 1.250 sp. gr., it should not dissolve, but after warming, the mixture should take up 50 per cent. of the glycerol, the remainder separating clear.

5. With an equal, or less than equal, bulk of collodion solution, it should not form any gelatinous compound.

6. With strong ammonia, after twenty-four hours, it ought to show an olive-green colour, not blue.

7. Baryta-water with alcoholic solution of creasote should not show any colour whatever, either blue or passing to red.

8. 1 part of creasote is soluble in 30 parts of boiling water; on cooling so much of it should separate that but 1 part should remain dissolved to 80 parts of water. Water containing carbonic acid dissolves creasote less readily; therefore in an aqueous solution left exposed to the air separation takes place and the solution is troubled.

The remainder of the paper contains information on cases in which creasote may be usefully employed in medicine and surgery, its effects and modes of application; and is not of chemical interest.

Creasote from Beech-Tar. (*Dingl. polyt. Journ.*, ccxlv. 91.) According to Hartmann and Hauers, pure creasote from beech-

wood tar consists of guaiacol and creosol, and forms a neutral, clear pale yellow, strongly refractive liquid having a smoky smell. Its sp. gr. is 1.07 at 15.6°; it boils at 205–225°, and dissolves in 200 parts of water. By mixing 2 c.c. of the creasote with 8 c.c. of water and 2 c.c. soda-ley (sp. gr. 1.33), a light yellow, perfectly clear solution should be obtained, and a similar result with light petroleum. If the mixture does not dissolve, it indicates the presence of considerable quantities of phenol and creosol. By adding a few drops of water to the solution and shaking it vigorously, no separation should be effected. If it occurs, it may be recognised as an oily layer suspended between the petroleum and the water. In this case, also, phenol and creosol are present, although in smaller quantities. If, on mixing the same solution with about 4 c.c. of a cold saturated solution of barium hydroxide, the petroleum assumes a blue colour, and the aqueous solution turns red, the creasote contains oily bye-products. When a mixture of 2 c.c. creasote and 2 c.c. collodion is shaken, no signs of a gelatinous precipitate should be observed. From a mixture of 9 c.c. glycerol of sp. gr. 1.23, 3 c.c. water, and 4 c.c. creasote, the latter separates completely after a time.

Oxidation of Pyrogallol in Presence of Gum Arabic. P. der Clermont and P. Chautard. (*Comptes Rendus*, xciv. 1255–1256. From *Journ. Chem. Soc.*) When an aqueous solution of pyrogallol is mixed with aqueous solutions of gum arabic of different strengths, and exposed to the air, purpurogallin is formed in considerable quantity, as Struve has previously pointed out (*Annalen*, cliii. 160). 10 grams pyrogallol are dissolved in a small quantity of water, mixed with 500 c.c. of a 10 per cent. aqueous solution of gum arabic, and exposed to the air. Purpurogallin is deposited after a few hours, and its formation continues for about two months. At the end of this time 67 parts purpurogallin are obtained for every 100 parts pyrogallol. The gum is removed by repeated decantation with water, the last traces being separated by dissolving the crystals in alcohol. The purpurogallin forms golden-yellow needles, frequently united in bundles, and of the composition $C_{20}H_{16}O_9$.

In the formation of the purpurogallin, oxygen is absorbed from the air, but the gum arabic does not act simply as a ferment, for a small quantity of gum will not bring about the oxidation of an unlimited quantity of pyrogallol. The gum itself undergoes some change, but the products of its alteration have not yet been isolated. The gum cannot be replaced by gummic acid.

Action of Sulphuric Acid on Protocatechuic Acid. E. Noelting and R. Bourchart. (*Bull. Soc. Chim.* [2], xxxvii. 394-397.) 1 gram protocatechuic acid is heated with 2 grams of benzoic acid and 50 grams of sulphuric acid of 66° B., at 140-145° for eight hours, and the product is poured into water, which throws down a deep brown flocculent precipitate; this is collected, dissolved in dilute soda solution, and precipitated by hydrochloric acid, this treatment being repeated several times. The clear brown flocculent substance thus obtained produces, with mordants, almost the same shades as alizarin, but is distinguished from the latter by the reddish brown colour of its alkaline solution, and by its absorption spectrum. The yield is very small, whatever the proportion of sulphuric acid, the time of heating, and the temperature. The benzoic acid appears to play no part in the reaction, for when protocatechuic acid is heated alone at 140-145°, with 20-25 times its weight of sulphuric acid, the same product is obtained, although in this case also the yield is very small.

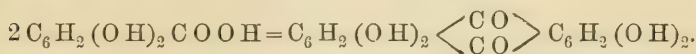
The substance thus formed yields an orange-yellow alcoholic solution, which becomes violet with a yellowish fluorescence on addition of potash. After some time the compound is precipitated in red flakes. *Alcoholic lead acetate* throws down a flocculent brown precipitate: *calcium chloride* and *barium chloride* produce a violet fluorescence in the yellow solution, and after some time a precipitate is formed; *ferric chloride* gives a blackish brown, *ammonia* a violet-brown, and *alum* a reddish precipitate. Its solution in dilute ammonia is brownish red, approaching violet. In this solution calcium and barium chlorides produce a brown, lead acetate a reddish brown, and absolute alcohol a violet-brown precipitate. Its solution in dilute potash gives, with absolute alcohol, a reddish precipitate, with alum a reddish lake, and with ferric chloride a blackish green lake. The substance is dissolved by strong sulphuric acid, with formation of a brownish violet solution, which, when poured into water, yields a yellow solution and a slight precipitate. It also dissolves in glacial acetic acid, forming an orange solution. It cannot be sublimed without decomposition.

The properties of this substance agree with those of *rufiopine*,

$C_6H_2(OH)_2 \begin{matrix} < \text{CO} > \\ \text{CO} & \end{matrix} C_6H_2(OH)_2$, obtained by Anderson (*An-*

nalen, xcviii. 51) by the action of concentrated sulphuric acid on opianic acid at 180°, and described by Liebermann and Chonjnacki (*Annalen*, clxii. 321). By analogy from the behaviour of other

hydroxyl-derivatives of benzoic acid, protocatechuic acid ought to form a colouring matter according to the equation,



This reaction is more complicated in the case of opianic acid; but since in both compounds the hydroxyl groups occupy the same positions with respect to the carboxyl groups, it is highly probable that they will yield identical condensation-products when acted on by sulphuric acids.

Action of Iodine on Silver Salts of some Aromatic Acids. K. Birnbaum and H. Reinherz. (*Ber. der deutsch. chem. Ges.*, xv. 456-460.) The action of iodine on silver salts of fatty acids has already been studied. When iodine and silver benzoate are warmed together at 150° , a violent reaction takes place, with evolution of a small quantity of carbonic anhydride. Iodine (2 atoms) is warmed with silver benzoate (1 mol.) As soon as the first action ceases, the mixture is heated at 160 – 180° as long as carbonic anhydride is evolved; it is then exhausted with alcohol, filtered from the silver iodide, and after being shaken with mercury to remove excess of iodine, is evaporated and dissolved in sodium carbonate, which leaves an insoluble oily residue. This solidifies after a time, and crystallizes from alcohol in almost colourless, transparent, rhombic crystals, containing iodine, melting at 128 – 130° , and having a diphenyl odour. The sodium salts in solution are converted into barium salts, and the barium benzoate separated from the *meta*-iodobenzoate by fractional crystallization. The latter forms colourless crystals; the free acid melts at 186° . Silver salicylate and iodine also react violently. Equal molecules of them were treated in a similar way to the above. The products are *di-iodosalicylic*, *monoidosalicylic*, and *salicylic acids*, and a small quantity of a resinous body containing iodine. Silver phthalate, heated with sufficient iodine to convert the silver into iodide, yields phthalic anhydride; and if the mixture of silver salt and iodine is heated at 170° , a mixture of silver iodide and iodate is left after extracting with alcohol.

Synthesis of Aromatic Hydrocarbons. H. Goldschmidt. (*Ber. der deutsch. chem. Ges.*, xv. 1066-1068; and *Journ. Chem. Soc.*, 1882, 952.) Aromatic ethers and homologues of aniline have been obtained by the action of zinc chloride on the phenols and mixtures of aniline and the paraffinoid alcohols. By a similar reaction the author has obtained homologues of benzene by the action of zinc chloride on mixtures of benzene and its homologues with the

paraffinoid alcohols. Thus, benzene and isobutyl alcohol give isobutylbenzene and dibutylbenzene; toluene and butyl alcohol give methylbutylbenzene, and benzene and ethyl alcohol give ethylbenzene, although in the latter case the yield was small, owing to difficulties of manipulation.

Commercial Oil of Thyme. J. S. Lemberger. (*Pharm. Journ.*, 3rd series, xiii. 531.) With a view to ascertaining the truth of the statement that the oil of thyme of commerce is often deprived of its thymol, the author examined nine samples purchased in New York and Philadelphia. One of these gave 38.75 per cent. of thymol, while the other eight percentages varied from 0.42 to 16.67. One sample, which could be especially vouched for as a pure distillate of *Thymus vulgaris*, gave only 0.84 per cent. The red oils were the richest in thymol.

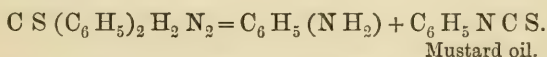
The Essential Oil of Angelica Root. F. Beilstein and E. Wiegand. (*Ber. der deutsch. chem. Ges.*, xv. 1741-1742.) From the authors' results, the oil extracted from the roots of *Angelica archangelica* appears to consist almost entirely of terpenes, $C_{10}H_{16}$, boiling at 158° (sp. gr. 0.8609 at 16.5°), at 176° (sp. gr. 0.8481 at 16.5°), and a third portion which distils at 250°.

The Essential Oil of Angelica Root. L. Naudin. (*Bull. de la Soc. Chim.*, xxxix. 406-409.) The author's previous results are not comparable with those of Beilstein and Wiegand, as the oil then reported upon by him was obtained from the seeds, while that examined by the two chemists named was prepared from the root. This latter oil has now also been examined by the author, who finds that it has a specific gravity of .875 at 0° C., and that it slowly resinifies with absorption of oxygen. When distilled at normal pressure it yields 50 per cent. of a fraction between 163° and 167°, and 25 per cent. in all of fractions at 167-175°, 175-280°, and 280-330°, while a semi-fluid residue remains having a very high boiling point. Distilled in vacuo it yields 75 per cent. of a fraction boiling at 160°, possessing a pepper-like odour and an absolute rotatory power of 5° 39' in a column of 200 m.m. This body answers to the formula $C_{10}H_{16}$, and is called by the author, *β-terebangelene*. The commercial oil from the root, therefore, appears to consist of a terpene and its polymerides.

Occurrence of Carvacrol in the Ethereal Oil of Garden Sage (*Satureja Hortensis*). E. Jahns. (*Ber. der deutsch. chem. Ges.*, xv. 816-819; and *Journ. Chem. Soc.*, 1882, 1065.) This oil is a yellow mobile liquid having an odour resembling that of thymol, and exhibiting feeble lævogryate properties. Its refractive index

for D is 1.493 at 15°, and its sp. gr. is 0.898 at 15°. The sample investigated had the following percentage composition: carvacrol, 30; cymene, 20; and a terpene (b. p. 178–180°), 50. The presence of a small quantity of a phenol producing a violet coloration in solutions of ferric chloride was also observed. The author finds that, contrary to the generally accepted statements, carvacrol produces a green coloration in solutions of ferric chloride. The following physical constants of the terpene formed in the oil have been determined: sp. gr. = 0.855 at 15°; refractive index = 1.481. Carvacrol occurs also in origanum oil and in oil of *Thymus serpyllum*; in the latter it is accompanied by thymol.

Preparation of Mustard Oils. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xv. 985.) The author states that the mustard oils are best prepared from the disubstituted sulpho-ureas, by treating them with a concentrated aqueous solution of phosphoric acid. The sulpho-ureas are easily obtained by treating carbon bisulphide with the amines. Starting with carbon bisulphide and aniline, we get diphenyl-sulpho-urea, $\text{CS}(\text{C}_6\text{H}_5)_2\text{H}_2\text{N}_2$; and when this is treated with phosphoric acid it breaks up directly into aniline and phenyl-mustard oil, thus:—



Oil of Cinnamon Leaves. E. Schaer. (*Archiv der Pharm.* [3], xx. 492.) The author's results are in the main confirmatory of those previously published by Stenhouse (*Pharm. Journ.*, xiv. 319). His attempts to confirm the presence of benzoic acid gave a negative result. Besides the other constituents found by Stenhouse, he detected in the oil a small quantity of a body possessing the properties of an aldehyde. The specific gravity of the oil he found to be 1.049 at 18.5°C.

Oil of Marjoram. F. Beilstein and E. Wiegand. (*Ber. der deutsch. chem. Ges.*, xv. 2855.) This oil consists of a terpene, $\text{C}_{10}\text{H}_{16}$, boiling at 178°C., and having a specific gravity of 0.8463 at 18.5°C., and a sesquiterpene, $\text{C}_{15}\text{H}_{24}.\text{H}_2\text{O}$, which is not affected by boiling with metallic sodium.

Oil of Erigeron Canadense. F. Beilstein and E. Wiegand. (*Ber. der deutsch. chem. Ges.*, xv. 2854.) The principal constituent of this oil is a terpene of 0.8464 specific gravity, boiling at 176°C., and forming with hydrochloric acid a crystalline dihydrochlorate which fuses at 47–48°C.

Oil of Erechthites. F. Beilstein and E. Wiegand. (*Ber. der deutsch. chem. Ges.*, xv. 2854.) The authors find this oil to consist almost entirely of terpenes boiling between 175° and 210° C.

The Action of Iodine Pentabromide on Volatile Oils. C. Forney. (*Amer. Journ. Pharm.*, 1882, 546.) The author prepared iodine pentabromide, IBr_5 , by dissolving 127 grains of iodine in 400 grains of bromine. All the oils used were of the best commercial quality, and pure. The test was applied by placing five or six drops of the volatile oil on a watch-glass and adding one drop of the pentabromide. Corresponding experiments were performed, also, with the same volatile oils previously mixed with 25 per cent. of oil of turpentine and the same proportion of 95 per cent. alcohol. Croton oil was examined in the same manner. The results are given in the table on pages 156, 157.

The behaviour of the oils of cinnamon, cubeb, juniper, lemon, orange, peppermint and tansy under the above circumstances seems to deserve attention. Except in a few instances, violet and orange-coloured vapours were evolved during the reaction. The reactions were increased in the presence of oil of turpentine and diminished with alcohol.

Ledum Camphor. E. Hyelt and U. Collan. (*Ber. der deutsch. chem. Ges.*, xv. 2500.) The name "ledum camphor" was given by Grassmann to the solid volatile oil obtained by him, in 1831, from *Ledum palustre*, and subsequently examined by Trapp and Ivanoff. The authors find that this body shows no resemblance to the other camphors from a chemical point of view. They obtained it in needle-shaped crystals fusing at 101° C., and having a composition represented by the formula $\text{C}_{25}\text{H}_{44}\text{O}_2$, which differs from that of previous investigators.

Action of Zinc Chloride on Camphor. A. Reuter. (*Ber. der deutsch. chem. Ges.*, xvi. 624-629.) The author distils camphor and zinc chloride according to Fittig's method, treats the distillate with strong soda solution, to separate the phenols, and then with concentrated sulphuric acid, the mixture being well cooled. From the soda solution he obtains orthocresol and higher boiling phenols. On mixing the sulphuric acid extract with water an oil separates containing camphor and a body probably identical with Schwanert's camphrene (*Annalen*, cxxiii. 228). The residual mixture of hydrocarbons was distilled over sodium, converted into sulphonic acids, and the latter purified by means of the barium and sodium salts. It contained toluene, pseudo-cumene, cymene, and laurene, and also some hydrocarbon oil (probably paraffins) insoluble in sulphuric acid.

The Testing of Otto of Roses. (*Chem. and Drugg.*, from *Repertorio di Chimica et Farmacia*.) The following method of detecting probable adulterations is recommended:—Put in a small test-tube one drop of the otto, and add four drops of concentrated sulphuric acid. When the mixture has cooled add 2 grams of absolute alcohol and shake well. If the rose oil was pure the mixture is slightly opalescent, and on heating becomes a yellowish brown, which remains after cooling. But if geranium, pelargonium, or palma rose oil had been mixed with it, the solution becomes cloudy, and after a little time an insoluble precipitate separates. When treated with sulphuric acid, too, it will be noted that pure rose otto retains its pleasant odour, while the other oils develop a repulsive odour. Fatty oils, such as almond or sesame oil, which are sometimes employed to dilute otto, are recognised by leaving a greasy stain on paper after warming.

Turmeric Oil. C. L. Jackson and A. E. Menke. (*Amer. Chem. Journ.*, iv. 368–374. From *Pharm. Journ.*) This oil, to which turmeric (and therefore curry powder) owes its aromatic taste and smell, was extracted from Bengal turmeric with light petroleum, and after being freed from the higher boiling portion of that solvent by heating to 150° in a flask, formed a thickish oily yellow liquid, having a pleasant aromatic odour. It was purified by fractional distillation under diminished pressure, and was thereby separated into three portions, the first boiling below 193° , the second at 193 – 198° , and the third consisting of a viscous semi-solid residue. The middle portion consisted of nearly pure turmerol; the first, of that compound contaminated with hydrocarbons from the petroleum. The middle fraction, after further purification by distillation in a vacuum, gave, as a mean result of several analyses, 83.62 per cent. carbon, and 10.42 hydrogen, agreeing nearly with the formula $C_{19}H_{28}O$, which requires 83.81 C and 10.29 H.

Turmerol is a pale yellow oil, having a pleasant, moderately strong aromatic smell, and a density of 0.9016 at 17° . It is optically dextrogyrate, $[\alpha]_D = 33.52$. Under ordinary pressure it boils at 285 – 290° , but decomposes at the same time, yielding a substance of lower boiling point. Under 60 mm. it boils at 193 – 198° ; still, however, with slight decomposition. It is essentially insoluble in water, but mixes readily with all other ordinary solvents. It does not unite with acid sodium sulphite.

Turmerol is an alcohol, and is converted by heating at 150° with strong hydrochloric acid into turmeryl chloride, $C_{19}H_{27}Cl$, which is a pale brownish fragrant oil decomposed by distillation. The

See page 154: ACTION OF IODINE PENTABROMIDE ON VOLATILE OILS.

Oils.	Pure Oils.		Oils + 25 per cent. Oil of Turpentine.		Oils + 25 per cent. Alcohol.	
	Reaction.	Colour.	Reaction.	Colour.	Reaction.	Colour.
Almond, bitter.	None.	Orange-red.	Slight reaction and sputtering.	Brownish yellow.	None.	Orange-red.
Amber, rectified.	Slight.	Cloudy green; dark precipitate.	Brisk; effervescence; slight sputtering.	Brown-red.	Slight effervescence.	Cloudy olive; black precipitate.
Anise.	Violent; sputtering.	Brown-red.	Very violent.	Yellowish brown.	Brisk; slight eff. and sputtering	Brown-red.
Bay.	Violent; brisk effervescence; sputtering.	Brownish green.	" "	Colourless or yellowish.	" "	Olive-green.
Bergamot.	Violent; brisk effervescence; sputtering.	Olive-green.	" "	Brownish, then greenish yellow.	" "	Brownish.
Camphor.	Violent; brisk effervescence; sputtering.	Brownish red.	" "	Brownish red.	Brisk effervescence.	Brown-red.
Caraway.	Violent; brisk effervescence; sputtering.	Greenish yellow.	" "	Reddish brown.	Slight effervescence.	Cloudy, brownish yellow.
Cassia.	Slow; slight effervescence.	Greenish brown.	Brisk effervescence.	Cloudy, blackish brown.	" "	Yellowish to greenish brown.
Cinnamon, Ceylon.	Violent; brisk effervescence; sputtering.	Cloudy, blackish brown.	Very violent.	Olive-green, then greenish black.	" "	Brown-red.
Cloves.	" "	Brown sediment.	" "	Dark brown.	" "	Cloudy, yellow.
Copaiba.	Slight; gentle effervescence, green vapours	Green.	Brisk; effervescence; green vapours.	Brownish, then olive-green; black precip.	Brisk; slight effervescence	Green.
Croton.	None.	Greenish yellow.	Brisk effervescence.	Brown-red.	None.	Cloudy, yellow.
Cubeb.	Violent; brisk effervescence; sputtering.	Greenish yellow dark green upon mixing or stirring.	Very violent.	Cloudy, inky, then clear, olive-green.	Like pure oil.	Dark to light green.

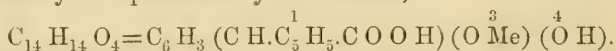
Fennel.	"	"	"	Brown-red.	"	"	Dark brown.	Slight efferves.	Red-brown.
Hemlock.	"	"	"	Brownish yellow.	"	"	Brownish yellow.	Brisk slight efferv.	Cloudy, yellowish brown.
Horsemint.	"	"	"	low.	"	"	Straw yellow.	Brisk efferves.	Brownish red.
Juniper.	"	"	"	Green; black precipitate.	"	"	Sea-green.	Brisk; slight eff. & sputtering	Green & brown layers; after mixing dark green.
Lavender.	"	"	"	Greenish brown.	"	"	Greenish brown.	Brisk; slight effervescence	Yellowish dark brown.
Lemon.	"	"	"	Brownish yellow.	"	"	Cloudy, dark yellow.	Brisk; slight eff. & sputtering	Yellow and brown layers; not miscible.
Orange.	"	"	"	low.	"	"	Cloudy, dirty violet; then clear, dark yellow.	"	Brownish yellow; brown precipitate.
Pennyroyal.	"	"	"	Black precipitate.	"	"	Dark brown.	Like pure oil; less sputtering.	Dark brown.
Peppermint.	"	"	"	Cloudy, blackish brown.	"	"	Cloudy, purplish black; then blue-black &inky-green	Brisk; slight efferves. and sputtering.	Bright green, then cloudy.
Pimenta.	"	"	"	Cloudy, blackish brown.	"	"	Greenish brown.	"	Cloudy, greenish brown
Rosemary.	"	"	"	Greenish brn.	"	"	Greenish brown.	"	Reddish brown.
Sassafras,	"	"	"	Reddish brn.	"	"	Reddish brown.	Like pure oil.	Light brown.
	"	"	"	Yellowish, then light grey.	"	"	Reddish yellow.	"	
Savin.	"	"	"	then light grey.	"	"	Greenish brown.	Brisk; slight eff. & sputtering	Cloudy, yellowish brown.
Spearmint.	"	"	"	Greenish brown.	"	"	Reddish brown.	"	Brownish yellow.
	"	"	"	Brownish yellow.	"	"	Reddish brown.	"	
Spruce.	"	"	"	low.	"	"	Reddish yellow.	"	Light brown.
Tansy.	"	"	"	Dark brown.	"	"	"	"	Yellow and red layers; not miscible.
	"	"	"	Brownish yellow, then colourless.	"	"	"	"	
Wintergreen.	Slight; gentle effervescence.	"	"	Reddish brown.	More active than with pure oil.	"	Straw colour.	Slight effervescence.	Cloudy yellow.

same compound is formed, but less definitely, by treating turmerol with phosphorus trichloride; the pentachloride appears to act partly in the same manner, but at the same time to add chlorine. By treating turmeryl chloride with boiling water, and with alcoholic solution of sodium acetate, potassium cyanide or ammonia, substances are obtained having the characteristic odours of the classes to which they belong, but they have not yet been obtained pure. Turmerol, treated with sodium yields a semi-solid mass having the composition of *sodium tumerylate*, $C_{19}H_{27}ONa$.

Isobutyl tumerylate, $C_{19}H_{27}OC_4H_9$, prepared by boiling the sodium compound with isobutyl iodide in a reflux apparatus, is a heavy, yellowish, fragrant oil. The *ethylic ether* is a similar substance.

Oxidation of Turmerol.—By the action of a hot aqueous solution of potassium permanganate in excess, turmerol is oxidized to terephthalic acid. With a cold solution of the same salt, not in excess, it appears to yield some new acids, with the study of which the authors are at present occupied.

Curcumin. C. L. Jackson and A. E. Menke. (*Amer. Chem. Journ.*, iv. 360-368.) In a former paper (*Year-Book of Pharmacy*, 1882, 81), the authors described the preparation and properties of curcumin, the yellow colouring matter of turmeric, and showed that it may be represented by the formula,



In the present paper they describe the products obtained from it by the action of nascent hydrogen and of bromine.

Curcumin Dihydride, $C_{14}H_{16}O_4$, obtained by the action of sodium amalgam and water on curcumin, is a brownish white powder, melting near 100° , insoluble in water, freely soluble in alcohol and glacial acetic acid, slightly in ether, insoluble in benzene and light petroleum. It dissolves in strong sulphuric acid with reddish brown colour, in caustic soda and sodium carbonate on warming; the latter solution, however, depositing a brown precipitate as it cools.

An Anhydride of Curcumin Dihydride, $C_{28}H_{30}O_9 = (C_{14}H_{15}O_4)_2O$, obtained by heating curcumin with acetic acid of 85 per cent., and a large quantity of zinc-dust, at a temperature below the boiling point of the acetic acid, is a dirty white powder closely resembling the dihydride, and melting gradually near 120° . It is nearly insoluble in ether, light petroleum, and benzene, slightly soluble in chloroform, more soluble in alcohol and glacial acetic acid, from

which it is deposited on evaporation as a varnish. It dissolves with yellow colour in aqueous potash, and with brown colour in a boiling solution of the carbonate, but without forming a definite potassium salt.

When diethyleurcumin, obtained as described in the author's former paper, is treated with acetic acid and zinc-dust, it yields a mixture of *di-* and *mono-ethyleurcumin dihydride*, which is slowly oxidized by potassium permanganate, yielding ethylvanillic acid, together with a small quantity of ethylvanillin, indicated by its characteristic smell.

Tetrabromocurcumin, $C_{14}H_{10}Br_4O_4$, is formed by the action of bromine in excess on curcumin dihydride dissolved in acetic acid. The liquid left over night turns black, and on addition of water yields the tetra-bromo-compound, as a red amorphous precipitate, which does not melt below a red heat, but seems to decompose without melting. It is insoluble in water, light petroleum, and benzene; very slightly soluble in alcohol and ether, more freely in glacial acetic acid; not acted on by strong sulphuric acid, but vigorously attacked by boiling aqueous potash, forming a red solution, from which acids precipitate a black tarry body nearly free from bromine, whence it may be inferred that all the bromine in the original substance is situated in the side chain.

Curcumin Tetrabromide, $C_{14}H_{14}Br_4O$, is formed on leaving curcumin suspended in carbon bisulphide in contact with excess of bromine for some hours, and is left, as the solvent evaporates, as a whitish amorphous substance, melting with decomposition near 185° , insoluble in water, soluble with decomposition in alcohol and glacial acetic acid, very slightly soluble in ether, chloroform, and carbon bisulphide, insoluble in light petroleum and benzene. Potassium hydroxide and silver oxide convert it into vanillin; aniline and metallic zinc act upon it, the former with considerable evolution of heat.

Pentabromocurcumin Dibromide, $C_{14}H_9Br_7O_4$, is obtained by treating curcumin dissolved in glacial acetic acid with excess of bromine, or the solid tetrabromide with bromine, as a red amorphous substance melting near 120° , insoluble in water and in light petroleum, soluble in alcohol, ether, and glacial acetic acid, slightly soluble in benzene. Strong sulphuric acid acts on it but slowly. When heated alone, it gives off bromine and hydrobromic acid, leaving a black tar from which alcohol extracts a yellow substance containing bromine. Sodium hydroxide, sodium carbonate and water, and sodium ethylate and water all act upon it, but no smell

of vanillin has been observed in either case. The same is true of the action of several oxidizing agents, and this would seem to indicate the presence of part of the bromine in the benzene ring. It is remarkable that this substance is but slowly attacked by chromic acid mixture, and by potassium permanganate, both of which act vigorously on curcumin.

A New Class of Colouring Matters. O. Fischer and C. Rudolph. (*Ber. der deutsch. chem. Ges.*, xv. 1500-1505, and *Journ. Chem. Soc.*, 1882, 1066.) The authors have investigated "flavaniline," the characteristic product of the action of zinc chloride at 250-270°, on acetanilide. The colouring matter, which dyes silk bright yellow with a moss-green fluorescence, is the monacid salt of a strongly diacid base, which is thrown down by ammonia from a solution of the former, as a milky precipitate which ultimately takes the form of long needles. These are slightly soluble in water, freely in alcohol, they melt at 97°, the colour changing to yellow.

The empirical composition of the base is represented by the formula $C_{16}H_{14}N_2$, and its formation from acetanilide, therefore, by the equation, $2C_8H_9NO = C_{16}H_{14}N_2 + 2H_2O$. The base is not affected by nascent hydrogen ($Sn + HCl$). The diacid salt is prepared by pouring the aqueous solution of the monacid salt into cold concentrated hydrochloric acid, in which it is almost insoluble. It is dissolved by water with re-formation of the monacid salt. The platinochloride, $C_{16}H_{14}N_2 \cdot 2HCl \cdot PtCl_4$, was obtained by adding the solution of the base in hot concentrated hydrochloric acid to a platinum chloride solution.

Ethylflavaniline was obtained by heating an alcoholic solution of the base with ethyl iodide at 110°. Red needles separated on cooling, and were purified by recrystallization from dilute hydriodic acid. The resulting compound is the hydriodate of monoethylflavaniline, $C_{16}H_{13}EtN_2 \cdot HI$; the base is precipitated by ammonia from the solution of this salt as a colourless resinous mass. Its salts have a redder tone than the corresponding salts of flavaniline, and dye silk orange.

Phenylflavaniline is obtained by heating the base with aniline and benzoic acid at 170°. Its salts crystallize well, and are yellow coloured.

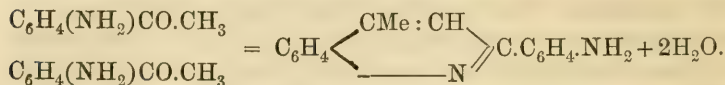
Reaction with Nitrous Acid.—On adding sodium nitrite to a solution of the monacid salt, a diazoamido-compound is thrown down as a yellowish red crystalline precipitate. If the decomposition be effected, with suitable precautions, in presence of excess of acid, a phenol is obtained, and may be isolated in the form of

colourless plates melting at 238° , and subliming without decomposition. According to analysis its empirical formula is $C_{16}H_{13}NO$. It possesses both acid and basic properties, and its salts are beautifully crystalline. On distillation with zinc-dust, the phenol is converted into a new base, *flavoline*, $C_{16}H_{13}N$, which distils above 360° as a yellowish oil; on exposure to a freezing mixture, the oil solidifies to a mass of four-sided plates melting at 65° . The picrate and the chromate of this base are very insoluble. Its nitrogen-atom is not attacked by nitrous acid. The authors regard it as a derivative of quinoline, and flavaniline as a monamide-derivative of flavoline, in support of which they cite the result of the nitration and amidation of the base, whereby they obtained a colouring matter which appeared to be identical with flavaniline.

The further investigation of this base as the type of a new series is in progress.

A New Class of Colouring-matters. E. Besthorn and O. Fischer. (*Ber. der deutsch. chem. Ges.*, xvi. 68-75; *Journ. Chem. Soc.*, 1883, 600.) Some time ago Fischer and Rudolph investigated "flavaniline," at the same time expressing their opinion that it is a quinoline derivative. This view is now confirmed by the following observations:—The vapour-density of *flavoline* is in accordance with the formula, $C_{16}H_{13}N$, previously given; this body, when warmed, emits an odour resembling that of the quinoline bases. On nitrating flavoline, a mononitro-body is produced, which on reduction yields amidoflavoline, identical with flavaniline. This identity was confirmed by means of the hydrochlorides, and also by the conversion of amidoflavoline into flavenol. Acetyl-flavenol is obtained by boiling flavenol with an excess of acetic anhydride for an hour, diluting with water, and neutralizing with alkali. It crystallizes from alcohol in long needles melting at 128° . By the oxidation of flavenol (1 part), in alkaline solution, with potassium permanganate (6 parts), an acid is obtained melting at 182° with violent evolution of carbonic anhydride, and yielding an oily distillate which has the characteristic odour of the quinoline bases. This distillate is probably lepidine, and the acid, lepidinecarboxylic acid. If nine parts of permanganate are used instead of six, picoline-tricarboxylic acid is produced. It crystallizes from water in colourless shining needles, with 2 mols. H_2O . From these facts the authors conclude that flavoline is represented by the formula $C_{10}H_8N$. Ph. (phenyl-lepidine), that flavenol is the hydroxy-compound $C_{10}H_8N.C_6H_4.OH$, and flavaniline the corresponding amido-derivative. They explain the formation of flavaniline from acetanilide by assuming a mole-

cular change, by which the latter yields amidoacetaphenone. It is then easy to see how flavaniline could result by abstracting 2 mols. of water from 2 mols. of orthoamidoacetophenone—



By interrupting the reaction of zinc chloride on acetanilide as soon as the colouring matter begins to be formed, the authors have further succeeded in obtaining a small quantity of an oil having the odour and other properties of orthoamidoacetaphenone. Flavaniline can also be obtained by the action of acetic chloride on aniline sulphate or on acetanilide in the presence of zinc chloride.

Propionanilide also gives a yellow dye, whilst formanilide yields colourless derivatives.

The base $\text{C}_{14}\text{H}_{11}\text{N}$, previously mentioned as having been formed from diphenylamine and glacial acetic acid, has been obtained in a pure condition melting at $92-94^\circ$. The hydrochloride crystallizes in yellow plates. Its dilute aqueous solution shows a splendid blue-green fluorescence.

Madder Colours. A. Wurtz. (*Comptes Rendus*, xcvi. 465-471. From *Amer. Journ. Pharm.*) This paper is a report drawn up by Wurtz on a memoir of Rosenstiehl on the colouring matters of the madder root. From this root five separate colouring substances can be extracted: alizarin, purpurin, madder-orange, pseudopurpurin, and purpuroxanthin. The researches of Græbe and Liebermann have fixed the constitution of the two former, whilst Rosenstiehl has studied more especially the three latter substances. He has shown that purpuroxanthin is isomeric with alizarin, and can be converted into purpurin by fusion with potash; and inversely purpurin can be reconverted into purpuroxanthin by the action of reducing agents; but if the action be prolonged, hydropurpuroxanthin is formed.

Rosenstiehl has also devised a new method of formation of purpurin. On heating the madder root with sulphurous acid, Kopp obtained a product known as *commercial purpurin*; as this substance is useless for dyeing purposes, it has been customary to heat it to 180° with glycerol to convert it into *solid purpurin*. This *rationale* of the process Rosenstiehl has explained; the "commercial purpurin" contains pseudopurpurin, which possess no tinctorial properties, but is easily decomposed into carbonic anhydride and purpurin; this latter dyes a brilliant madder-red. Rosenstiehl has

succeeded in separating the pseudopurpurin, and shows that it is a monocarboxyl-derivative of purpurin, thus: purpurin, $C_{14}H_5O_2(OH)_3$; pseudopurpurin, $C_{14}H_4O_2(OH)_3COOH$.

This fact has thrown an unexpected light on the practical industry of the madder; for it has long been observed that madder of Avignon gave a more solid dye-stuff than the madder of Alsace. It is now shown that this fact is due to the greater quantity of lime in the Avignon soil, which serves to eliminate the pseudopurpurin as a lime compound, and prevents it being fixed to the tissue of the root.

It has also been customary in Alsace to add small quantities of chalk to the dye-baths; this also prevents the fixation of the pseudopurpurin, which passes into the residues, where it may be decomposed by sulphuric acid and converted into useful purpurin. Rosenstiehl has also studied madder-orange, identical with the munjistin of Stenhouse, and has shown that it is a monocarboxyl-derivative of purpuroxanthin, bearing to it the same relation that pseudopurpurin does to purpurin. These researches also show that the madder-root contains, besides alizarin existing as such, three glucosides, viz., one which gives pseudopurpurin or purpurincarboxylic acid, a second which gives alizarincarboxylic acid, and a third which gives munjistin or xanthopurpurincarboxylic acid. The memoir presented to the Academy contains a full account of the various substances obtained from madder, and their physical properties as absorption-spectra.

Chlorophyll. A. B. Frank. (*Journ. Micr. Soc.*, 1882, 528, and *Pharm. Journ.*, 3rd series, xiii. 262.) The investigations of Pringsheim on the nature and mode of formation have been gone over by the author, and among other interesting results arrived at, he concludes that the change of colour of leaves in autumn is due to the disappearance of the protoplasm of the cells, in consequence of which the chlorophyll grains come into contact with the acid cell sap, the result being the change of the green colour into yellowish green or yellow, followed by the separation of oily drops of hypochlorin. The same change takes place in fruits, and also in leaves which become yellow from want of light. Wiesner regards the protection of chlorophyll from injury as one of the functions of vegetable protoplasm.

Nitration of Cellulose. M. Vieille. (*Comptes Rendus*, xcv. 132-135, and *Journ. Chem. Soc.*, 1882, 1184.) The cellulose used was in the form of cotton-wool. The lowest nitration product, mononitro-cellulose, is obtained by the action of nitric acid of

sp. gr. 1.450. It is insoluble in ethyl acetate and in a mixture of alcohol and ether; analysed by Schloesing's method, 1 gram yields 108.9 c.c. of nitric oxide. A nitration product, soluble in a mixture of alcohol and ether, and therefore suitable for making collodion, is given only by acid of sp. gr. between 1.490 and 1.496. It retains the structure of the original cotton, and is entirely soluble in ethyl acetate; 1 gram yields 183-194.4 c.c. of nitric oxide. The time required to produce the maximum nitration with acid of a particular strength is longer the weaker the acid, 2 to 3 hours sufficing with acid of sp. gr. 1.50, whilst acid of 1.483 requires 120 hours. With acid of sp. gr. 1.470, however, the cotton swells up and dissolves immediately, and under these conditions nitration is rapid: when the syrupy solution is poured into water, a white precipitate, which has none of the structure of the original cotton, is thrown down. Acid of sp. gr. 1.460 acts only slowly on cotton, but the fibres become very brittle, and the product is collected in the form of a pulp. Weaker acid has little or no action on cotton. The maximum nitration is obtained with a mixture of nitric and sulphuric acids. The result is not sensibly affected by the relative proportions of the two acids, even if Nordhausen sulphuric acid is used; but a large excess of sulphuric acid considerably diminishes the rapidity of the reaction. The product has the composition $C_{24}H_{29}(NO_2)_{11}O_{20}$, retains the appearance of the original cotton, is completely soluble in ethyl acetate, but only very slightly soluble in a mixture of alcohol and ether. 1 gram yields 214 c.c. of nitric oxide.

Direct Fermentation of Starch. V. Marcano. (*Comptes Rendus*, xcv. 856-859; *Journ. Chem. Soc.*, 1883, 365.) The Indians of South America make an alcoholic liquor, called *chicha*, by the fermentation of Indian corn. The corn is first allowed to soak for from four to six hours, to soften it, and afterwards fermented. The fermentation is not due in the first instance to the action of a diastase present in the grain; because if powdered maize be boiled with water for a quarter of an hour, and then left at rest, fermentation soon sets in. The effect is produced by a minute organism, which can be detected by the microscope.

The first action of this organism, however, is to form a diastase, which thus either produces or aids fermentation. This is shown by the fact that a mixture of maize-starch with water saturated with chloroform remains almost unaltered (chloroform prevents the action of those organisms which cause fermentation, but does not interfere with the action of diastase); whereas a similar solution

without chloroform is soon found to contain (after being freed from organisms by filtration through porous porcelain under pressure), matter capable of producing fermentation. Alcohol precipitates the diastase from the solution.

The same organism causes lactose, mannite, and dulcite to ferment, and it may be used to produce *koumiss* by adding it to milk containing lactose in proportion to the strength required.

The organism which causes maize-starch, and starchy grain in general, to ferment, and which is found in the stalks of the Indian corn, is identical with that which produces the fermentation of the juice of the sugar-cane in sugar manufactories. The germs are found in the cells of the stalks of the plant.

Elementary Composition of Starch. F. Salomon. (*Journ. für pract. Chem.* [2], xxv. 348-362.) The experimental results on this subject being of a contradictory nature, and the important question as to the composition of starch not being as yet satisfactorily answered, the author has made it the subject of a very extensive series of experiments. Before starting the ultimate experiments, he made a careful analysis of the starch used, by the method described in the *Repert. für Analyt. Chemie*, i. 274, and made a series of preliminary experiments to study the properties of the starch-sugar, already published. In one experiment he found that the sugar itself underwent a change by boiling with sulphuric acid, which, however, did not alter the polarisation, but made a difference in the reducing power as regards Fehling's solution (after four hours boiling with dilute acid [1:19] the loss = 4.95 per cent.); he thinks this the cause of Allihn's small yields of sugar. The potato-starch employed in these experiments contained 76.50 per cent. pure starch, 0.247 residue insoluble in dilute acid, 0.273 ash, 22.980 water. The following method of conversion is employed: 3 grams of air-dried starch are mixed in a flask with 200 c.c. water and 20 c.c. hydrochloric acid (sp. gr. 1.125). The flask (fitted with a reflux condenser for the polarisation experiments) is heated in a water-bath for three hours. Sufficient potash is then added to nearly neutralize the acid, the solution made up to a definite volume, and the sugar determined by Allihn's method; the results obtained agree with those of Allihn, the mean of six experiments (three of the author's and three of Allihn's) showing that sugar formed = 111.16 per cent. of the starch employed. In addition, he has made several determinations of the sugar by taking the sp. gr. and the rotatory power, and with similar results. In the polarisation experiments, he takes care

to use the sugar solutions always of about the same degree of concentration. The results tend to show that $C_6H_{10}O_5$ really represents the composition of potato-starch: for the equation $C_6H_{10}O_5 + H_2O = C_6H_{12}O_6$, requires that 100 parts of pure dry starch should yield 111.11 parts of sugar. The author thinks it probable that all starches are not alike, differing as they do in their physical and chemical properties: for instance, wheat-starch behaves differently from potato-starch with iodine solution, and according to Sachsse gives higher results on conversion into sugar.

The method of conversion described above is advantageous on account of the moderate temperature, quickening the conversion by the use of stronger acid, and the avoidance of high pressure.

The Formula of Starch. T. Pfeiffer, B. Tollens, and F. Salomon. (*Bied. Centr.*, 1882, 775.) From further investigations by these three authors, it appears that the formula $C_{24}H_{40}O_{20}$ should be accepted as the one correctly representing the composition of the molecule of starch. For inulin and dextrin they give $C_{12}H_{20}O_{10}$ as the proper molecular formula.

Conversion of Starch into Dextrose. E. Delarne. (*Bied. Centr.*, 1882, 413.) The author recommends the use of oxalic acid in the place of sulphuric acid for this conversion, as the latter imparts an unpleasant taste to the product. With 0.003 part of oxalic acid to 1 of starch, the process can be completed in forty-five minutes at a temperature of $140^{\circ}C$.

Schwarz's Process for Preparing Pure Grape-Sugar. Worm-Müller and J. Otto. (*Bied. Centr.*, 1883, 68.) An excess of crude sugar is slowly introduced into a mixture of 600 c.c. 80 per cent. alcohol, and 20 c.c. fuming hydrochloric acid at 25° , then filtered and set aside to crystallize. Purification is further attained by washing and by recrystallization from alcohol. The alkaline mercuric cyanide process for estimating dextrose is accurate when the solution is diluted with 3 vols. water and the sugar solution contains about 1 per cent. of sugar.

Preparation of Pure Starch-Sugar. F. Soxhlet. (*Dingl. polyt. Journ.*, cclxv. 121-125.) For the preparation of pure anhydrous dextroglucose, $C_6H_{12}O_6$, the author evaporates a solution of starch-sugar in a vacuum, until a sample, on cooling, can only just be kneaded into a dough. The syrupy mass thus obtained is mixed in closed vessels with boiling-hot methyl alcohol, the quantity required depending on the purity of the starch-sugar and the quality of the product. For ordinary (20 to 30 per cent.) starch-

sugar, 100 parts of syrup require 70–80 parts alcohol. The crystallization is facilitated by adding anhydrous crystallized starch-sugar. The granular mass is separated from the liquid by machining and pressing. Granular porous starch-sugar is obtained in the form of solid lumps of well-formed shining crystals, resembling refined loaf-sugar, by concentrating a perfectly clear, colourless solution of starch-sugar in a vacuum. The syrup should remain quite clear. 100 parts of the latter are mixed at 70° with 10–25 parts boiling hot pure methyl alcohol. The mixture is then poured into conical moulds, cooled to 30–35°, and kept at this temperature for two or three days, when the liquid is drawn off. If dense and solid sugar is required, the porous mass, after the removal of the liquid, is saturated once or twice with a mixture of 100 parts concentrated syrup and 80–100 parts alcohol at the ordinary temperature, until the necessary density has been reached. The liquid is then drawn off, the mass treated with alcohol, pressed, and the alcohol removed by distillation in a vacuum at a temperature increasing slowly from 30° to 60°. The sugar is kept at this temperature for several hours. The starch-sugar hitherto prepared contains, beside water, 20–30 per cent. uncrystallizable and unfermentable substances of gum-like consistency. To produce pure starch-sugar of crystalline structure, Soxhlet proposes to remove the impurities by means of ethyl and methyl alcohol, and to crystallize the purified and sufficiently concentrated product at above 30°. Solid translucent starch-sugar (ordinary hydrated glucose) of distinctly crystalline structure, is obtained by cooling the syrup from starch-sugar at above 30°. While the solutions of starch-sugar solidify at the ordinary temperature in layers of opaque, warty, microscopic tabular crystals, the mass obtained at a temperature above 30°, from more concentrated solutions, forms transparent prismatic crystals distinctly visible to the naked eye.

Preparation of Grape-Sugar by Neubauer's Modification of Schwarz's Method. W. Müller. (*Journ. für pract. Chem.* [2], xxvi. 78–87, and *Journ Chem. Soc.*, 1882, 1275.) In reply to Soxhlet, the author states that pure grape-sugar can be prepared by the above process; and that Knapp's solution can be used for the titration of grape-sugar. These statements are proved experimentally. From a series of experiments he infers that the most efficient solution for the inversion of the raw sugar is 600 of alcohol to 40 of fuming hydrochloric acid, the temperature should be about 15°, and the duration of the experiment from three to four weeks. When the solvent contains less hydrochloric acid, or when the temperature

is too low, only a comparatively small quantity of the raw sugar is dissolved, and therefore the grape-sugar which is formed takes a very long time to deposit; on the other hand, with stronger solutions of hydrochloric acid, or with higher temperatures, the solutions are always discoloured. The author has prepared pure grape-sugar in the following manner:—As much raw sugar as will dissolve is added to the solution of 40 c.c. hydrochloric acid in 600 c.c. of alcohol, at the ordinary temperature; the solution is repeatedly shaken, and after three or four weeks is filtered and left to crystallize. Crystallization is complete in about six weeks, the crystals are separated from the liquid by filtration on a vacuum filter, well washed by grinding with small quantities of 90 per cent. alcohol, and left in it for a day, and again collected. This operation is repeated until the washings have no acid reaction; this washing is of the utmost importance. The sugar thus prepared is quite pure, and after drying over chloride of calcium, melts at 146° , and gives a clear colourless solution; it is not blackened by concentrated sulphuric acid.

Knapp's solution can be successfully employed for the titration of grape-sugar, provided the solution is diluted, and the sugar added gradually. In the appended tables are the results of the titration of the same sugar by Fehling and Knapp solutions:—

		Fehling.	Knapp.
3 per cent. aqueous solution	grape-sugar	3.03	3.01
2	"	2.03	2.0
1	"	1.01	1.01

Solutions of grape-sugar in urine—

With 3 per cent. of sugar	.	.	.	3.12	2.94
With 2	"	"	.	2.16	2.19
With 1	"	"	.	1.13	1.19

Preparation of Grape-Sugar, and its Titration with Knapp's Solution. J. G. Otto. (*Journ. für pract. Chem.* [2], xxvi. 87–103, and *Journ. Chem. Soc.*, 1882, 1276.) This paper, like that of W. Müller, is in answer to Soxhlet. The author finds the process adopted by Müller the most economical and also the most efficient method for the preparation of glucose, and obtains the largest yields under these conditions. Dissolve 230 grams raw sugar in 600 c.c. 80 per cent. alcohol + 20 c.c. hydrochloric acid, keeping the temperature at 25° ; subsequent treatment is the same as described in Müller's paper. The author has likewise improved the process used by Soxhlet, inasmuch as he has shortened the time occupied in

crystallizing the glucose from alcohol; thus: a saturated solution of grape-sugar in alcohol is made by boiling them together in a flask with reflux condenser, and filtered through a hot-water filter into a flask cooled by a stream of cold water, the crystallization being complete after standing twenty-four hours in a cold place. The crystals are then washed with alcohol, and dried over calcium chloride or sulphuric acid. The process is superior to the other as regards quickness, but is less economical. Some grape-sugar crystallized from methyl alcohol was compared with the above products, and all three were found to be alike. With regard to the use of Knapp's solution, the author has found that for solutions containing 1 to 0.5 per cent. sugar, it ought to be diluted with 4 vols. of water, for those of 0.5 to 0.1 per cent. with 3 vols. of water, whilst for sugar solutions containing less than 1 per cent., 2 vols. water should be added; besides this, the sugar must be run in by degrees. The author proceeded as follows:—About the required quantity of Knapp's solution is diluted (as required) with water, the sugar solution is run in 2 c.c. at a time, the mixture being boiled for half a minute between each addition, the mercury is allowed to settle, and the clear solution tested by Pillitz's reaction; towards the end of the reaction the sugar is run in by smaller quantities (1–0.5–0.2 c.c.) at a time. As soon as the test on the filter-paper becomes doubtful, the filtrate is tested with acetic acid and hydrogen sulphide, until there is no more mercury in solution. The author has obtained these results:—

With a Knapp's solution + 3 vols. water: in a 1 per cent. sugar solution he found 0.992 per cent.; in a 0.5 per cent. solution, 0.498 per cent.; in a 0.25 solution, 0.249; in a 0.10 solution, 0.1; in a 0.05 solution, 0.049. With Knapp's solution + 4 vols. water, in the case of the 1 and 0.5 per cent. solution, the result was the same, but in the 0.25 solution it was too high. With a Knapp's solution + 2 vols. water, the result in the 0.1 per cent. solution was like the above, whilst in the 0.5 solution it was more exact. In each case, about 0.5 c.c. of sugar solution was added after Pillitz's reaction ceased to act, before all the mercury, rendered evident by the hydrogen sulphide and acetic acid, had disappeared. It is always advisable to dilute the sugar solution to about 1 per cent. or less before titrating.

Oxidation of Cane-Sugar. C. Heyer. (*Archiv der Pharm.* [3], xx. 336–350, and 430–450.)

Oxidation by Chromic Acid.—None of the notices on the oxidation of sugar by chromic acid give any quantitative data, merely stating

that formic acid and carbonic anhydride are produced. The author has, therefore, investigated the subject quantitatively, and finds that besides formic acid and carbonic anhydride, oxalic acid is also formed. In an exact determination, the precipitated chromic oxide interferes, so that the solutions were always acidified with sulphuric acid. The action commences at the ordinary temperature, but it is hastened by the application of heat; and the rapidity of oxidation increases with the concentration of the solutions and amount of chromic acid employed. All experiments were therefore made with the same quantities of materials, in the same quantity of solution, and at like temperatures. The point to determine was whether all the three substances were produced at the same time, or one after the other, the production of formic acid requiring 8 equivalents chromic acid, oxalic acid 12 equivalents, and carbonic anhydride 16 equivalents. The strength of the solution was 1 equivalent of each in 1,000 c.c. of water, and of the acid solution 8 c.c., 12 c.c., and 16 c.c., were used respectively. It was found that 8 equivalents were insufficient to completely oxidize 1 equivalent of sugar, and that all three products were formed, the reaction being $2\text{C O}_2 + 2\text{C H}_2\text{O}_2 + 2\text{C}_2\text{H}_2\text{O}_4$; with 12 equivalents of acid (180) the reaction is, $4\text{C O}_2 + 4\text{C H}_2\text{O}_2 + 2\text{C}_2\text{H}_2\text{O}_4 + 5\text{H}_2\text{O}$; in this case the completion of the reaction was aided by warming, but in a similar case, with the exception of the final heating, the reaction occurred thus: $2\text{C}_{12}\text{H}_{22}\text{O}_{11} + 22\text{Cr O}_3 = 4\text{C O}_2 + 10\text{C H}_2\text{O}_2 + 5\text{C}_2\text{H}_2\text{O}_4 + 11\text{Cr}_2\text{O}_3 + 7\text{H}_2\text{O}$. In the third experiment the mixture (containing 16 c.c. sol. acid) was heated to 120° , with a considerable quantity of sulphuric acid; the chromic acid was completely reduced, having oxidized the sugar wholly to carbonic anhydride.

Oxidation by Potassium Permanganate.—The earliest notice on the oxidation of sugar by permanganate was made by Liebig and Pelouze, who found that oxalic acid and nothing further was produced, unless an excess of the oxidizing agent was employed, and then the oxalates were converted in carbonates. Maumené afterwards thought that two new acids, hexepic, $\text{C}_6\text{H}_{12}\text{O}_8$, and trigenic, $\text{C}_3\text{H}_6\text{O}_5$, were formed. Heyer has repeated the experiments, employing a solution of sugar containing 1 equivalent in 2,000 c.c. One equivalent of sugar with 4K Mn O_4 does not react completely in the cold, but if 12K Mn O_4 is employed, and the mixture warmed, carbonic anhydride is produced, which forms the acid potassium salt, but no oxalic acid is produced. Experiments with 6 and 8 equivalents of permanganate yielded similar results, only the amount of carbonic anhydride produced was greater; when more

than 8 equivalents were employed, no reduction of the permanganate ensued. When 4 equivalents of permanganate were allowed to remain in contact with sugar for a long time, at the ordinary temperature, oxalic and formic acids were produced in addition to carbonic anhydride; but it was only when 12 equivalents reacted that complete oxidation occurred; no other acid, as tartaric, could at any time be detected. The reaction, therefore, which occurs at a high temperature, is $C_{12}H_{22}O_{11} + 12 KMnO_4 = 6 KHC O_3 + 6 KHC O_2 + 12 MnO_2 + 5 H_2O$.

The aid of heat may be dispensed with if the solutions are concentrated, the reaction occurring unassisted. The action of permanganate is therefore as follows:—In dilute solutions at the ordinary temperature, formic acid, much oxalic and little carbonic anhydride; on the other hand, when the solution is warm, and large quantities of permanganate in concentrated solutions are used, only formic acid and carbonic anhydride are formed; the higher the temperature and the greater the quantity and concentration of the solution, the greater the amount of carbonic anhydride produced. Maumené's experiments were repeated, and the solution after filtration was, as Maumené stated, no longer sweet, and was dextrorotatory; this was due to the presence of potash salts, but inverted sugar was also found to be present. Oxalic acid is also formed in the process; but this Maumené overlooked, or rather he considered the calcium oxalate to be a hexepate, and the lead hexepate is really a mixture of the oxalate and carbonate. As regards the supposed trigenic acid, the author thinks that it must have been a mixture of free acetic and formic acids with salts of potash, which was obtained by one of the processes of separation. Langbien's experiments were also repeated, and the influence of the presence of free sulphuric acid on the reaction was observed. When a sufficiency of acid is present, manganous salts, and not, as in the other experiments, manganese peroxides, were formed. Employing 5 equivalents of sugar and 24 equivalents of permanganate, 3 equivalents of carbonic anhydride were evolved, and formic acid remained in solution, oxalic acid being absent; but the whole of the sugar was not reduced, there being an insufficiency of permanganate. In a second experiment 5 equivalents of sugar and 48 equivalents of permanganate ($= C_{12}H_{22}O_{11} + O_{24}$) were heated at 120° for from two to three hours; this caused complete oxidation and formation of 12 equivalents of CO_2 . From these experiments we may conclude that the action of permanganate is similar to that of chromic acid; that the oxalic acid is formed only when the

solution of permanganate is dilute and cool; that the action of permanganate is intensified by the presence of sulphuric acid, carbonic anhydride and formic acid being produced, but the latter is completely oxidized at higher temperatures and with a greater quantity of the oxidizing agent.

Ethereal Nitrates from Milk-Sugar. G. G  . (*Journ. Russ. Chem. Soc.*, 1882, 253-260, and *Journ. Chem. Soc.*, 1882, 1042.) The products of the action of a mixture of nitric and sulphuric acids on lactose have only been superficially described by Reinchl and Vohl, and their statements contradict each other. In order to obtain the nitrates from lactose, the author proceeds as follows: One part of milk-sugar is added, in small portions, to five parts by weight of ice-cold fuming nitric acid (sp. gr. 1.5), and then two volumes of strong and cold sulphuric acid are added. The product of the reaction separates after some time, and floats on the surface of the liquid as a yellow, soft, waxy mass, which soon becomes hard. It is then repeatedly ground in a mortar with the mixture of the acids, left in contact with them for some time, and finally washed well with water. The white amorphous powder obtained in this way is soluble in alcohol and ether, but insoluble in water, and consists of a mixture of two compounds. In order to separate them, the mass is placed on a filter and washed with cold alcohol of 80 per cent., until the filtrate becomes colourless. The compound remaining on the filter is the *lactose penta-nitrate*, $C_{12}H_{17}(NO_2)_5O_{11}$. It is obtained after repeated recrystallizations from hot alcohol, in the form of semi-transparent colourless scales, which are easily reduced to a white powder. It is insoluble in water, but soluble in alcohol and ether. One part of the compound dissolves in 6.938 parts of boiling alcohol, and 63.45 parts of alcohol of 16  . Its sp. gr. at 0   is 1.684, its m. p. = 139.2  . It begins to decompose slightly at 84  ; at 135-140   it gives off yellow fumes and effervesces; and at 156   total decomposition with slight explosion takes place, and a brown mass is left behind. The air-dried substance does not suffer any loss of weight if heated at 75  , and, contrary to Vohl's statement, does not contain any water of crystallization. It explodes when struck with a hammer on an anvil. *Lactose tri-nitrate*, $C_{12}H_{19}(NO_2)_3O_{11}$, is found in the yellow alcoholic filtrate from the penta-nitrate, and forms, after the evaporation of the alcohol, a yellow mass of the consistency of beeswax, which becomes hard and brittle at temperatures below 0  . On drying it for a long time over sulphuric acid in a vacuum, the compound loses 5 per cent. of water, becomes hard, and is easily reduced to powder. In order to

get rid of the last trace of acid, the compound is dissolved in alcohol, the solution poured into water, and the process repeated several times. It is only very slightly soluble in water, but very easily in alcohol and ether, either hot or cold, and the yellow solutions have a bitter taste. The compound cannot be obtained in crystals. Its sp. gr. at 0° is 1.479, its m. p. 36.86° ; it is slightly decomposed at 90° , effervesces at 97° , gives off red-brown fumes at 107° , and decomposes totally at 110° with slight explosion.

If brought into contact with fresh quantities of sulphuric and nitric acids, it is converted into compounds containing a large number of the NO_2 groups. On exposing the ethereal solution of the products of reaction to a temperature of -25° , lactose tetranitrate, $\text{C}_{12}\text{H}_{18}(\text{NO}_2)_4\text{O}_{11}$, separates out. It is a yellow powder containing no water (m. p. $80-81^{\circ}$); it begins to decompose at 90° , and is totally destroyed at 165° .

Saccharin and Saccharic Acid. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, 2953-2960; *Journ. Chem. Soc.*, 1883, 565.) Saccharin is most conveniently prepared by treating a solution of 1 kilo. of invert cane-sugar in 9 litres of water, with 100 grams of slaked lime. After the liquid has remained fourteen days in a closed vessel, 400 grams of slaked lime are added, and the mixture is preserved for one or two months, until the clear liquid exerts only a feeble reducing action on an alkaline solution of copper sulphate. After the mixture has been filtered, the filtrate is saturated with carbonic acid, and the lime which remains in solution is exactly precipitated by oxalic acid; on evaporating the filtrate, saccharin is slowly deposited. Saccharin in aqueous solution slowly changes into saccharic acid; the presence of free oxalic acid is favourable to this reaction. On the other hand, saccharic acid is partially converted into its anhydride by boiling the aqueous solution.

Potassium saccharate, $\text{C}_6\text{H}_{11}\text{O}_6\text{K}$, crystallizes in thick monoclinic plates, $a : b : c = 1.2893 : 1 : 1.8861$, $\beta = 85^{\circ} 25'$. The *calcium* and *zinc salts* are amorphous. *Copper saccharate*, $\text{Cu}(\text{C}_6\text{H}_{11}\text{O}_6)_2 + 4\text{H}_2\text{O}$, forms blue crystals. By the action of nitric acid (sp. gr. 1.375) at 35° , saccharin is slowly converted into oxalic acid and a new acid, $\text{C}_6\text{H}_{10}\text{O}_7$; after removing the oxalic acid by boiling with calcium carbonate, the new acid is obtained in rhombic plates or prisms [$a : b : c = 0.6903 : 1 : 0.528$] which closely resemble crystals of citric acid in appearance. The crystals are soluble in water and warm ether, and the aqueous solution is feebly lævogyrate. This body acts not only as a monobasic acid, but also as a lactone.

Purification of Commercial Alcohol. A. Riche. (*Journ. de Pharm.* [5], v. 480-490.) Several methods have been proposed for purifying those portions of the spirit which are impregnated with aldehyde and essential oils, and are severally contained in the first and last portions of the distillation of the crude spirit. The most notable is that of oxidation, but this is attended with the formation of acetic acid and ethyl acetate at the expense of the alcohol.

The process here described is one of reduction invented by Naudin and Schneider, who subject the crude alcohol to the action of a zinc-copper couple, when the hydrogen evolved acts on the spirit, deodorising it. In the case of alcohol prepared from beet-root, the spirit is also passed through a series of special voltameters. A description of the process would be incomplete without the diagrams which accompany the paper.

R. Pictet has also devised a method for the rectification of alcohol. The crude spirit is distilled in a vacuum in a boiler fitted with a rectifying column and inverted condensers, whereby the temperature is maintained as low as possible, and the less volatile products return to the boiler. The first products of distillation are collected in one receiver, and when the purer alcohol begins to distil, it is collected in a second receiver. This alcohol is almost pure, since the low-boiling aldehydes, etc., with which the crude spirit is associated, distil over between the temperatures of -10° and $+5^{\circ}$. The alcohol thus purified is subjected to a further rectification in an apparatus connected with a condenser maintained at a temperature of -25° to -50° by liquid sulphurous anhydride.

The first portions are collected separately and re-rectified, the alcohol which afterwards distils being perfectly pure. By this process, pure alcohol is obtained at a very low cost.

Eismann treats the crude alcohol with ozone, by which the impurities are oxidized; a description of this process is reserved for a future communication.

Acetic Ether. Dr. W. I. Clark. (*Pharm. Journ.*, 3rd series, xiii. 777.) The author's experiments lead to the following conclusions:—

- (1) That the water in the crystallized salt should be removed.
- (2) That great excess of sulphuric acid or deficiency are equally to be avoided.
- (3) That any advantage gained by using absolute alcohol instead of s. v. rect. is very small, and not worth the extra expense.
- (4) That a slight excess of sulphuric acid is advantageous.
- (5) That in no case more than 91.2 per cent. of the theoretical

yield was obtained. This last is to some extent accounted for by loss from evaporation, etc.

(6) That solution of calcium chloride affords an excellent means of removing any alcohol present. If the percentage be but small, a single washing with an equal volume of this solution will practically effect separation.

(7) That it is exceedingly difficult to obtain anhydrous acetic ether, the last trace of water obstinately adhering.

(8) That the solubility in water is one part in nine by volume, a proportion which differs materially from those given in the British and United States Pharmacopœias.

(9) That the specific gravity of a perfectly pure anhydrous acetic ether lies between .9004 and .9012. The discrepancies between the statements of the British and United States Pharmacopœias and of other text-books, are accounted for by the presence of impurities in the preparations.

In the author's opinion the presence of 95 per cent. of actual acetic ether might be insisted upon as the minimum proportion in the medicinal article.

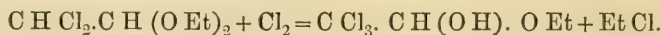
Some Reactions of Ethylene Bromide. F. Beilstein and E. Wiegand. (*Ber. der deutsch. chem. Ges.*, xv. 1368-1370; and *Journ. Chem. Soc.*, 1882, 1179.) On heating ethylene bromide with silver oxide and water, aldehyde and a small quantity of silver acetate are produced; but if silver carbonate is substituted for the oxide, glycol is formed. When silver carbonate, ethylene bromide, and benzene are heated at 55°, a dark heavy oil is produced.

By the action of silver sulphate on ethylene bromide diluted with benzene, bromethyl sulphate is obtained as a heavy oil, which is decomposed by boiling with water, forming bromethylsulphuric acid. This acid afterwards splits up into sulphuric acid, hydrobromic acid, and glycol. The crystalline barium salt is also very unstable. On warming a solution of the salt, barium sulphate is deposited, and glycol is formed. This salt does not appear to be identical with the barium salt of the acid which Wroblewsky (*Zeitschr. für Chem.*, 1868, 563) obtained by the action of fuming sulphuric acid on ethylene bromide.

Silver sulphate does not act on ethylene chloride in presence of water at 100°. No reaction takes place between ethylene bromide and silver sulphite at 55° in the presence of water.

Bromochloral, Chlorobromal, Bromochloroform, and Chloroform. O. Jacobsen and R. Neumeister. (*Ber. der deutsch. chem. Ges.*, xv. 599-602; *Journ. Chem. Soc.*, 1882, 938.) It is well known

that dichloroacetal is formed as an intermediate product in the preparation of chloral alcoholate, by the action of chlorine on alcohol, and that by the further action of chlorine, ethyl chloride and chloral alcoholate are obtained, thus :—



In a similar manner the action of bromine on dichloroacetal gives bromochloral alcoholate, and the action of bromine on monochloroacetal gives chlorobromal alcoholate.

Bromochloral, $\text{C Cl}_2 \text{ Br} \cdot \text{C O H}$, obtained by decomposing the alcoholate with cold concentrated sulphuric acid, is a colourless liquid, having an odour similar to that of chloral, but inducing tears even more strongly (b. p. = 126° ; sp. gr. at 15° = 1.9176). It becomes yellow on exposure to light. In presence of sulphuric acid it polymerises to *metabromochloral*, which is an amorphous, porcelain-like, scentless mass, insoluble in water, alcohol, and ether; it is reconverted into bromochloral on heating to 270° . *Bromochloral hydrate*, $\text{C Cl}_2 \text{ Br} \cdot \text{C H (O H)}_2$, is a hygroscopic, crystalline mass, easy soluble in water, alcohol, and ether, but less soluble in chloroform, from which it crystallizes in rhombic plates (m. p. 51°). *Bromochloral alcoholate*, $\text{C Cl}_2 \text{ Br} \cdot \text{C H (O H)} \cdot \text{O Et}$, crystallizes in fine silky needles (m. p. 43°). *Bromochloralid*, $\text{C}_5 \text{ H}_2 \text{ Cl}_4 \text{ Br}_2 \text{ O}_3$, obtained by heating a mixture of bromochloral and ordinary sulphuric acid containing a little of the fuming acid, crystallizes in colourless prisms (m. p. 122°).

Chlorobromal, $\text{C Cl Br}_2 \cdot \text{C O H}$, is a colourless liquid (b. p. $148\text{--}149^\circ$; sp. gr. 2.2793 at 15°), similar to bromochloral, except that it does not undergo polymerisation in presence of sulphuric acid. *Chlorobromal hydrate*, $\text{C Cl Br}_2 \cdot \text{C H (O H)}_2$, crystallizes in small prisms (m. p. $51\text{--}52^\circ$). *Chlorobromal alcoholate*, $\text{C Cl Br}_2 \cdot \text{C H (O H)} \cdot \text{O Et}$, forms long needles (m. p. 46°). Bromochloral and chlorobromal, like chloral, combine directly with amides. The compounds with acetamide crystallize from hot alcohol in leaflets, the melting point (158°) being identical with that of the corresponding compounds of bromal and chloral, which they also resemble in other respects. Bromochloral and chlorobromal hydrates give bromochloroform and chlorobromoform respectively when treated with potash. *Bromochloroform*, C H Br Cl_2 , is a colourless liquid (b. p. $91\text{--}92^\circ$; sp. gr. 1.9254 at 15°) which gradually becomes yellow on exposure to light. *Chlorobromoform*, $\text{C H Br}_2 \text{ Cl}$, is a liquid similar to the preceding compound (b. p. = $123\text{--}125^\circ$ with slight decomposition; sp. gr. 2.445 at 15°).

A New Reaction of Aldehydes. F. Penzoldt and E. Fischer. (*Ber. der deutsch. chem. Ges.*, 1883, 657.) On mixing diabetic urine with an alkaline solution of diazobenzolsulpho-acid, the authors observed, in the course of from ten to fifteen minutes, a red coloration, which gradually assumed a violet shade. The same phenomenon was observed with a solution of pure grape-sugar, and proved to afford a valuable general test for aldehydes.

Acetaldehyde behaves in the same manner as grape-sugar. With the more stable aromatic aldehydes, however, this coloration was not obtained under the conditions described, but it was promptly produced on the subsequent addition of sodium amalgam. The same addition also accelerates and intensifies the reaction with grape-sugar and acetaldehyde.

The reaction is so characteristic as to serve well for the detection of aldehydes, and is much more delicate than the well-known reaction with fuchsine-sulphurous acid. It is best performed as follows :—

A freshly-made solution of crystallized diazobenzolsulpho-acid in 60 parts of cold water is mixed with a small quantity of solution of sodium hydrate, then with the substance to be tested (also previously rendered alkaline), and finally with a few granules of sodium amalgam. In the presence of an aldehyde the reddish violet coloration will be distinctly seen within ten to twenty minutes. With oil of bitter almonds it is still discernible in solutions containing 1 in 3000.

Acetone and aceto-acetic ether yield a dark-red coloration under the same conditions, but not the characteristic violet shade.

Occurrence of Methyl Alcohol in the Products of the Dry Distillation of Colophony. W. Kelbe and J. Wolff. (*Ber. der deutsch. chem. Ges.*, xvi. 351, 352.) The authors have found methyl alcohol among the numerous products yielded by the destructive distillation of common resin. It occurs in the aqueous portion of the distillate, together with acetic acid and the higher acids of the same series. 150 kilograms of the commercial product yielded about 50 grams of pure methyl alcohol.

Products of the Distillation of Colophony. A. Renard. (*Comptes Rendus*, xciv. 141, 142, and *Journ. Chem. Soc.*, 1882, 1179.) The fraction boiling between 106° and 156° is relatively very small. It contains a higher homologue of heptene, *octene*, C_8H_{14} (b. p. 129-132°; vapour-density, 4.04; sp. gr. at 20° = 0.8158), soluble in alcohol and ether. Octene absorbs oxygen somewhat rapidly, but has no action on ammoniacal solutions of cuprous chloride or silver nitrate. It reacts violently with bromine, giving off hydrobromic acid

but if the hydrocarbon is added drop by drop to bromine in excess, allowed to stand twenty-four hours, and the product is washed with soda and treated with ether, it yields crystals of a tribromo-derivative, $C_8H_{11}Br_3$ (m. p. 246°), very slightly soluble in ether. The ethereal washings, when evaporated, leave a heavy orange-coloured oil, of the same composition as the crystals. If an ethereal solution of octine is added to an ethereal solution of bromine, a very unstable dibromide, $C_8H_{14}Br_2$, is formed. Nitric acid acts very violently on the hydrocarbon, with evolution of carbonic anhydride free from nitrous vapours, and formation of oxalic acid, succinic acid, and resinous products, which dissolve in the concentrated acid. By treatment with sulphuric acid, octine is polymerised with development of heat, but without evolution of sulphurous anhydride or formation of an appreciable quantity of sulphonic acid. When treated with hydrochloric acid gas, octine alone, or in ethereal solution, is altered, and turns brown, but yields no definite hydro-chloride.

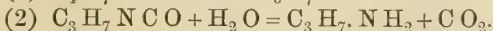
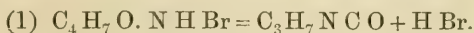
Action of Bromine in Alkaline Solutions on Amides. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xv. 752-762, and 762-775; *Journ. Chem. Soc.*, 1882, 1052.) It has been already shown that acetamide, when treated with bromine and sodium hydroxide, yields a bromo-derivative, and under other conditions a substituted carbamide, viz., methylacetyl carbamide (*Ber.*, xv. 407). In the case of the lower homologues of acetamide, similar compounds are formed; but with the homologues containing more than four atoms of carbon, the bromo-derivatives are not easily obtained, the products in all cases consisting of the substituted carbamides.

Formamide yields a monobromoformamide, $(CH_2O)NHBr$, which has not been isolated, but is further resolved into hydrobromic acid and cyanic acid, the latter being converted by polymerisation into cyanuric acid.

From *propionamide* the compound, $(C_3H_5O)NHBr$, has been obtained. It is more soluble than the corresponding acetyl-compound, and crystallizes in flat colourless needles, melting at 80° . By alkalis it is resolved into hydrobromic acid, carbonic anhydride, and ethylamine. *Ethyl-propionyl carbamide*, $NH Et. CO. NH (C_3H_5O)$, is prepared from propionamide; it crystallizes in slender needles melting at 100° . It is decomposed by nitric acid, yielding propionic acid and nitrate of monethylcarbamide.

Isobutylamide yields a monobromo-derivative, $(C_4H_7O)NHBr$, crystallizing from water in colourless transparent needles melting at 92° ; caustic alkalis convert this compound into hydrobromic acid, carbonic anhydride, and isopropylamine. The reaction takes place

in two stages, and when sodium carbonate is used the decomposition reaches only the first stage, and isopropyl cyanate is formed. The following equations represent this decomposition:—



Isopropyl-isobutyryl carbamide, $\text{NH C}_3\text{H}_7\text{CO} \cdot \text{NH} (\text{C}_4\text{H}_7\text{O})$, crystallizes from alcohol in tablets melting at 86° . Its formation is accompanied by that of di-isopropyl carbamide, $\text{CO} (\text{NH C}_3\text{H}_7)_2$.

Normal butyramide is the first of the amides which do not form bromo-derivatives which can be isolated. Like the higher amides, it is easily converted into a carbamide, viz., propyl-butyryl carbamide, $\text{NH C}_3\text{H}_7\text{CO} \cdot \text{NH C}_4\text{H}_7\text{O}$, which crystallizes in colourless leaflets, sparingly soluble in water, easily soluble in alcohol and ether, melting at 99° .

Isobutylvaleryl carbamide, $\text{NH C}_4\text{H}_9\text{CO} \cdot \text{NH} (\text{C}_5\text{H}_9\text{O})$, obtained from valeramide, crystallizes in colourless lustrous needles melting at 102° .

Amylicaproyl carbamide, $\text{NH C}_5\text{H}_{11}\text{CO} \cdot \text{NH} (\text{C}_6\text{H}_{11}\text{O})$, obtained from the amide of normal caproic acid, forms colourless leaflets (m. p. 97°). *Amylisocaproyl carbamide* is obtained from the amide of isocaproic acid (isobutylacetic acid); it melts at 94° .

In the seven-carbon series oenanthylamide was used, and found to yield *hexyloenanthylyl carbamide*, $\text{NH C}_6\text{H}_{13}\text{CO} \cdot \text{NH} (\text{C}_7\text{H}_{13}\text{O})$. It forms lustrous leaflets melting at 97° , is insoluble in water, and less soluble in alcohol than its lower homologue.

In the next series *octoxyamide* was taken. This amide is prepared from the caprylic acid obtained by oxidizing the higher-boiling portions of fusel oil. It forms *heptyloctoxyl carbamide*, $\text{NH C}_7\text{H}_{15}\text{CO} \cdot \text{NH} (\text{C}_8\text{H}_{15}\text{O})$, which crystallizes in small leaflets (m. p. 86°).

Octylnonoxyl carbamide, $\text{NH C}_8\text{H}_{17}\text{CO} \cdot \text{NH} (\text{C}_9\text{H}_{17}\text{O})$ (m. p. 87°), is obtained from the amide of nonoic acid, prepared by Kraft and Becker by the oxidation of castor oil.

Nonyldecoyl carbamide, $\text{NH C}_9\text{H}_{19}\text{CO} \cdot \text{NH} (\text{C}_{10}\text{H}_{19}\text{O})$, forms white lustrous leaflets (m. p. 101°). It is obtained from the amide of caprinic acid, which, like caprylic acid, is obtained by oxidizing fusel oil.

Stearamide has also been subjected to the action of bromine and caustic potash, and is found to yield *heptadecylstearyl carbamide*, $\text{NH C}_{17}\text{H}_{35}\text{CO} \cdot \text{NH} (\text{C}_{18}\text{H}_{35}\text{O})$, which crystallizes in leaflets having a mother-of-pearl lustre (m. p. 112°).

The remaining portion of the investigation is concerned with the formation of the primary amines by the action of caustic alkalies on the product obtained by treating amides with bromine. In this way acetamide yields methylamine, free from the secondary or tertiary amine, and the yield is such, viz., 87 per cent. of the theoretical, that the amide may be used as a method of preparing methylamine. To this end a mixture of 1 mol. acetamide and 1 mol. bromine is treated with a cold solution of caustic potash (10 per cent. KHO) until it becomes yellow. The product so obtained is heated at $60\text{--}70^\circ$ with a further quantity of caustic potash (3 mols. KHO to 1 mol. acetamide). In ten or fifteen minutes the solution is decolorized, and contains no longer bromacetamide, but methylamine, which latter is driven off by the application of heat, and collected in hydrochloric acid. The crude chloride contains some ammonium chloride, which is easily separated by crystallization from absolute alcohol. Some other compounds are formed simultaneously, amongst which may be mentioned carbon tetrabromide, and a compound having the formula MeNBr_3 , which is also produced when methylamine hydrochloride is treated with bromine.

In a similar manner, ethylamine is obtained from propionamide, isopropylamine from isobutyramide, and propylamine from butyramide. Isobutylamine (b. p. $65\text{--}67^\circ$) was prepared from valeramide. Normal pentylamine, $\text{CH}_3(\text{CH}_2)_4\text{NH}_2$, is obtained from normal capronamide; it is a liquid boiling at 103° , a boiling point which is higher than that of any of the isomerides. Isocapronamide yields an amylamine (isobutylmethylamine), boiling at $95\text{--}96^\circ$, and identical with that described by Wurtz (*Ann. Chim. Phys.*, 30, 44).

Normal hexylamine, $\text{CH}_3(\text{CH}_2)_5\text{NH}_2$, is obtained from the amide of oenanthylic acid: it is identical with that described by Pelouze and Cahours (*Annalen*, cxxiv. 295).

Heptylamine is obtained from octoxyamide. It is a liquid boiling at $153\text{--}155^\circ$; consequently much higher than that obtained by Pelouze and Cahours (*Ann. Chim. Phys.* [4], i. 5), and Schorlemmer from the heptane found in petroleum.

Octylamine is best prepared by digesting octylnonoxyl carbamide with concentrated hydrochloric acid; it boils at $171\text{--}174^\circ$.

Nonylamine is obtained from decoxyamide (capramide); it boils at 195° .

Heptadecylamine is obtained by fusing heptadecylstearyl carbamide with caustic potash, or by heating this compound with hydrochloric

acid at 200°. In this latter case, the product of the reaction consists of heptadecylamine hydrochloride, stearamide, and stearic acid, from the alcoholic solution of which platinum chloride precipitates the platino-chloride of heptadecylamine in yellow leaflets, from which the base has been prepared. It is a solid fat-like substance, inodorous, non volatile in steam, but may be distilled without decomposition, is insoluble in water, but soluble in alcohol, forming an alkaline solution. Its hydrochloride is insoluble in water, but soluble in alcohol.

Digestion of Cellulose. W. Tappeiner. (*Ber. der deutsch. chem. Ges.*, xv. 999-1002.) It has been established by Haubner and others that a considerable quantity of the cellulose of the fodder of ruminating animals disappears in the alimentary canal, but researches with the view of isolating a ferment which will dissolve cellulose have hitherto been unsuccessful. The experiments of Hofmeister have shown that this solution is not due to the action of the saliva, and those of Popoff that marsh-gas is evolved in the cloacum, which would seem to arise from the fermentation of cellulose.

In order to investigate this question, the author took weighed portions from the stomach, small intestine, and cæcum of a recently killed ruminant, and divided them into three portions, one of which was allowed to ferment at the temperature of the body; in the second the fermentation was hindered by the addition of antiseptics which had no influence on the action of unorganised ferments; and in the third the ferments, both organised and unorganised, were destroyed by boiling. In all these cases the quantity of the cellulose was determined. The second and third portions agreed in the quantity of cellulose, but the first portion, in the case of the stomach and cæcum, showed gradually diminishing quantities of cellulose. It would thus appear that the cellulose is dissolved by fermentation in these portions of the alimentary canal. The author also examined the gases evolved by the fermentation of flesh extract, cellulose, and stomach contents; in the case of flesh extract, carbonic anhydride and hydrogen, but in the case of cellulose, marsh-gas and carbonic anhydride, were evolved. Similar results were obtained with paper and cotton, which could be seen by the naked eye to disappear gradually with evolution of marsh-gas.

Behaviour of the Bile Acids with Albumen and Peptones, Antiseptic Action of the Bile Acids. R. Maly and F. Emich. (*Monatsh. Chem.*, iv. 89-120.) On mixing solutions of peptone, or of propeptone, and taurocholic acid, a white milk-like precipitate is obtained, in such a fine state of division as to readily pass through

filter-paper, and to require some days to settle to the bottom of the precipitating vessel, where it then forms a resin-like layer. It is readily soluble in alkaline liquids, even in sodium hydrogen bicarbonate solution saturated with carbonic anhydride, or in blood serum; addition of hydrochloric or acetic acid to these solutions reprecipitates it. It is insoluble in common salt solution. It dissolves in alcohol, and the solution gives merely a faint red coloration with potash and copper sulphate, showing that the precipitate can contain but little peptone; the precipitate appears to consist essentially of taurocholic acid which is precipitated by the peptones in a manner similar to its precipitation by sodium chloride. Glycocholic acid is not precipitated by the peptones.

On mixing solutions of albumen and taurocholic acid, a white flocculent precipitate is obtained, consisting of albumen and a small quantity of taurocholic acid, the latter being, in all probability, merely held mechanically by the albumen; the precipitation of the albumen is so complete that no reaction is given in the filtrate with tannic acid or phosphotungstic acid, although the latter reagent, according to Hofmeister, can detect 1 part of albumen in 100,000 parts of water. From these results taurocholic acid is regarded by the author as a reagent of great importance, precipitating albumen and syntonin, but not peptone and propeptone, whilst all the other delicate reagents for albumen also precipitate the peptones. Glycocholic acid precipitates albumen but very partially.

The antiseptic properties of bile have been long known, although no researches have been made as to which constituent the antiseptic action was due; the authors show that taurocholic and glycocholic acids, and especially the former, are powerful antiseptics, that the addition of 0.2 per cent. solution of either acid will prevent the putrefaction of flesh (with pancreas a 0.5 per cent. solution of taurocholic acid or a 1 per cent. solution [suspension] of glycocholic acid was required to prevent putrefaction). The fermentation of sugar by yeast was prevented by the addition of 0.5 per cent. of taurocholic acid; but the addition of glycocholic acid, on the contrary, appears to accelerate the fermentation. The lactic fermentation is prevented by addition of 0.25 per cent. of taurocholic acid; glycocholic acid, although not stopping the fermentation, makes it proceed very slowly. The digestive action of pepsine is prevented by 0.2 per cent. of taurocholic acid; 1 per cent. of glycocholic acid has, on the contrary, no action. The conversion of starch into sugar by trypsin is prevented by the addition of 0.1 per cent. of either acid; by ptyalin, by the presence of 0.2 per cent. of taurocholic acid or of 1

per cent. of glycocholic acid. The decomposition of amygdalin by emulsion is prevented by 0.5 per cent. of taurocholic acid; 1 per cent. of glycocholic acid is without influence on the reaction.

Pancreatic Digestion. E. Duclaux. (*Comptes Rendus*, xcv. 808-810; *Journ. Chem. Soc.*, 1882, 1118.) The action of the pancreatic secretion was examined by the author by introducing fragments of the pancreas itself into solutions in such a manner as to prevent access of the ferment germs usually present in the pancreatic juice. A small fragment of the pancreas caused the liquefaction of starch-paste and the disappearance of the starch granules, with the exception of their interior covering, which is formed of cellulose. A milligram of pancreas tissue rendered 10 c.c. of milk transparent in a few hours, and then it was not precipitable either by acids or by potassium ferrocyanide. The action of the pancreas on raw meat consisted of a solution of the interfibrillary substance, so that the elementary fibrillæ became separated, and this was followed by the gradual transformation of the whole of the meat into a pulp, without, however, a complete solution taking place. Fragments of pancreas which had remained for a year were removed with their original forms and dimensions from the vessels in which they had produced these transformations. This shows that, contrary to the received opinions, the pancreas does not digest itself.

Gastric and Pancreatic Digestions. J. Béchamp. (*Comptes Rendus*, xciv. 883-886.) The experiments described in this paper tend to establish the difference between the gastric and pancreatic digestions. In the former the rotatory power of the transformed matter is but little lessened, or remains unchanged, or is increased, whilst in the latter it is always enormously lowered.

Formation of Peptone, and its Conversion into Albuminoid Substances. A. Poehl. (*Journ. Russ. Chem. Soc.*, 1882, 353, 354.) The author has established the occurrence of peptone in urine by analysis. Moreover, many animal and vegetable tissues were found to exhibit the properties of peptones, so that many physiological and pathological processes, hitherto unexplained, become clear. In order to investigate the relation of peptones to albumen, the author has studied the conversion of peptone into albumen. The conversion of albumen into peptone is, according to his view, due to the swelling up of the *colloid* of albumen. The inner constitution of peptone remains the same as that of albumen unaltered in this process of swelling up, as has been found by the study of the optical phenomena occurring during the peptonization of albumen.

The Constitution of Albuminoids. M. Béchamp. (*Journ. de Pharm.* [5], vi. 8.) The author's memoir contains the results of attempts to separate definite substances from various albuminoid matters, and enumerates the various ferments that he has found associated with them, as well as their properties.

Pepsin. M. Chapoteaut. (*Comptes Rendus*, xcv. 140. From *Pharm. Journ.*) A short time ago the author described a pulverulent white body that had been obtained by precipitating with 95° alcohol an aqueous solution of gastric juice that had been first dried and washed with ether. Finding that alcohol appeared to modify the precipitate, the aqueous solution was acidulated with sulphuric acid, which even in excess does not redissolve the precipitate, whilst hydrochloric acid dissolves it readily (*Comptes Rendus*, xcv. 140). In this way he obtained a white precipitate, closely resembling an albuminoid in composition, which appeared to constitute the active portion of the gastric juice, and which he considers is entitled to the name "pepsin." It dissolves in water at the ordinary temperature to the extent of 2 grams to the litre. It is soluble in alkalis, being precipitated from such solutions by acids whilst gradually losing its properties. This "pepsin" occurs in the gastric juice as a salt of potash, together with another albuminoid without solvent action on blood fibrin, and a fat acid without solvent action and incapable of displacing the pepsin from its combination with potassium.

Pepsin. A. Mayer. (*Moniteur Scient.* [3], xiii. 842; *Pharm. Journ.*, 3rd series; xii. 262.) In some experiments as to the conditions conducive to the action of pepsin, made by the author, it was found that the action was favoured by elevation of temperature; the limit is, however, reached at 55° C., for between 55° and 60° the ferment is killed. Hydrochloric acid of a strength corresponding to 2 parts of acid in 1,000 was found best to promote the action. Other acids were tried and gave results corresponding with the following order:—nitric, oxalic, sulphuric, lactic, tartaric, formic, succinic, acetic, butyric, salicylic. The last two had no action. Coagulated albumen was the substance operated upon, and the pepsine used was prepared by macerating the mucus from a pig's stomach with glycerine and precipitating with alcohol. The presence of bacteria did not in any way retard the action of pepsin.

Urochloralic Acid and Allied Bodies. V. Mering. (*Ber. der deutsch. chem. Ges.*, xv. 1019-1021.) The author, in conjunction with Musculus, has shown that, after doses of chloral hydrate, the

urine contains a lævorotatory acid which reduces cupric oxide, named *urochloralic acid*, $C_7H_{12}Cl_2O_6$, which on boiling with alkalis turns brown and gives an odour of caramel. Similar compounds have been found after introduction into the system of nitrobenzene and other aromatic compounds. The author finds that urochloralic acid has the formula $C_8H_{11}Cl_3O_7$, and is decomposed, on boiling with dilute acids, into trichlorethyl alcohol and glycuronic acid, thus: $C_8H_{11}Cl_3O_7 + H_2O = C_2H_3Cl_3C + C_6H_{10}O_7$. Similarly, after taking butylchloral hydrate, the urine contains an acid, $C_{10}H_{15}Cl_3O_7$, which on boiling with acids is decomposed into trichlorobutyl alcohol and glycuronic acid. The former substance crystallizes in long prisms (m. p. 60° , b. p. 200°), converted by oxidation into trichlorobutyric acid. The trichlorethyl and trichlorobutyl alcohols are formed by reduction processes in the animal organism.

Synthesis of Uric Acid. J. Horbaczewski. (*Monatsh. Chem.*, iii. 796.) Pure glycocine (from hippuric acid) was finely pulverized and mixed with ten times its weight of pure urea prepared from ammonium cyanate, and the mixture was heated in a small flask placed in a metal bath at $200\text{--}230^\circ$, till the liquid, at first colourless and transparent, became brownish yellow and turbid. The melt when cold was dissolved in potash, and the solution, after supersaturation with sal-ammoniac, was precipitated with a mixture of ammoniacal silver solution and magnesia-mixture. The resulting precipitate was well washed with ammoniacal water and decomposed with potassium sulphide, the liquid filtered from silver sulphide, and the filtrate, after acidulation with hydrochloric acid, was concentrated on the water-bath, whereby uric acid was separated. The crude product thus obtained was redissolved in potash-lye and the above-described process twice repeated, whereby ultimately a yellowish crystalline powder was obtained, exhibiting the composition, physical properties, and all the reactions of uric acid.

Synthesis of Tyrosine. E. Erlenmeyer and A. Lipp. (*Ber. der deutsch. chem. Ges.*, xv. 1544, and *Journ. Chem. Soc.*, 1882, 1063.) Tyrosine has been obtained hitherto only as a product of decomposition of proteïds; after a long series of attempts, the authors have devised a method which contains at least the promise of its synthetic production. Phenylamine was converted into paranitrophenylamine, then into the corresponding amido-compound, and this, by the action of nitrous acid, into parahydroxyphenylacetic acid and a substance which remained in aqueous solution after exhaustion of the former by means of ether. The aqueous solution was super-

saturated with ammonia and evaporated, yielding a crystalline mass having all the characteristic properties of tyrosine.

Regarding the constitution of tyrosine, Barth long since (*Annalen*, clii. 100) inferred it to be parahydroxy-phenylamidopropionic acid; the methods proposed by him (*Ibid.*, clxiii. 296) and by Beilstein (*Ibid.*, clxiii. 142), however, for its preparation are imperfect, in failing to recognise tyrosine as the α -amido-acid, which identity the authors have established.

A fuller communication on the subject, of which this is only a preliminary notice, is promised, together with incidental observations on several new compounds, *e.g.*, parathiophenylalanine, para- and ortho-nitrophenyl, α -nitroxypropionic acid, paramidophenyllactic acid, hydroxyhydrocarbostyryl, and paramidophenylalanine.

Occurrence of Protocatechuic Acid in Urine. W. Smith. (*Ber. der deutsch. chem. Ges.*, 1883, 578.) The urine of an apparently healthy child, which always assumed a dark colour on standing for some time, produced with basic lead acetate a precipitate containing an acid, not volatilizable with steam, and forming a green coloration with ferric chloride and a brown one with alkalis. The author believes that body to be protocatechuic acid.

Extraction of the Colouring Matters of Urine containing Indigotine and Indirubine. C. Méhu. (*Journ. de Pharm. et de Chim.*, Feb., 1883.) The author renders the urine in question distinctly acid by the addition of a few drops of sulphuric acid, and then saturates it with ammonium sulphate as a dry powder. The pigments urobiline, bilirubine, biliverdine, etc., are immediately separated. The liquid is filtered, the precipitate washed with a small quantity of a saturated solution of ammonium sulphate. To obtain the whole of the blue (indigotine) and red (indirubine) of violet or blue urine it is sufficient to proceed as already indicated, adding the sulphuric acid drop by drop, so as to leave about 1 gram of free sulphuric acid per kilo. of liquid. Ammonium sulphate is then added in large excess. The precipitate and filter are washed as before with a saturated solution of ammonium sulphate slightly acidified with sulphuric acid. The dry filtrate is of a violet colour, and retains ammonium sulphate, sometimes albumen, urates, various histological elements, and lastly the small trace of the blue and red colouring-matters. The indirubine is dissolved out by treating the dry filter with alcohol at 50 per cent. Solvents appear to act differently upon the indigotine from indigo, and that from urine.

MATERIA MEDICA AND PHARMACY.



PART II.

MATERIA MEDICA AND PHARMACY.

Curacao Aloes. MM. Stallman and Fulton. (*Drug World.*)

This species of aloes deserves a wider attention than has heretofore been given to it. A recent analysis made by Professor Otto Worth, analytical and consulting chemist, of Pittsburg, of the usual kind of Curaçao aloes, proves it to contain :—

Extractive matter (aloin)	. . . . .	78.78
Resina	. . . . .	18.94
Albumen	. . . . .	2.14
Organic Salts of Potash.	. . . . .	2.12

Which analysis shows it to be fully equal to any samples of Socotrine aloes heretofore tested. While for purity and cleanliness the Curaçao aloes is at least equal to Socotrine, the price is at present only a little above the common Cape aloes, and it is attracting the attention of manufacturers and the trade in general.

New Reactions of Aloes. A. Klunge. (*Archiv der Pharm.*, 1883, 363.) An aqueous solution of aloes or of aloin, when diluted to such an extent as to be almost colourless, assumes, on the addition of copper sulphate, an intense yellow coloration, which, on the addition of sodium chloride or potassium bromide, and subsequent heating, or on the addition of alcohol, changes to a deep red or violet.

The red or violet coloration obtained by means of iodic acid is less characteristic, as it is not obtained with all kinds of aloes.

Reactions of Aloes. W. Lenz. (*Zeitschr. für Analyt. Chem.*, xxi. 220–228.) Klunge states (*Schweiz. Wochenschr. für Pharm.*, xviii. 170) that benzene extracts nothing from aqueous or alcoholic solutions of *Aloe lucida*; but that from solutions of *Aloe hepatica*, benzene, chloroform, and carbon bisulphide extract a yellow colouring matter which becomes pink on addition of ammonia. In fairly concentrated solutions of both kinds of aloes, ferric chloride pro-

duces a brownish black coloration. Iodine solution, added to a solution of *Aleo hepatica*, produces a beautiful reddish violet colour, whilst it hardly affects a solution of *Aloe lucida*.

The term *Aloe hepatica* being used somewhat vaguely for any sort of liver-coloured aloes, Lenz examined undoubtedly genuine samples of aloes from Natal, Barbadoes, and Curaçao, and of *Aloe lucida*. He found that benzene extracts from 0·3 to 3 per cent. from their aqueous solutions, and that therefore Klunge's statement is not strictly accurate.

He also investigated Bornträger's reaction (*Zeitschr. für Analyt. Chem.*, xix. 165), consisting in the addition of ammonia to the benzene extract, with which it produces a reddish violet coloration. He confirms this observation, but points out that extracts of frangula, rheum, senna, and *Spina cervina* also yield red or violet colorations closely resembling those due to aloes. These extracts also behave like aloes with iodine solution.

Whilst Klunge's and Bornträger's tests are therefore untrustworthy, Dragendorff's method was found to be perfectly satisfactory. It consists in the extraction of the fluid to be examined with amyl alcohol, which, on evaporation, leaves a residue of bitter taste, giving in solution precipitates with bromine dissolved in potassium bromide, basic lead acetate, mercurous nitrate, and tannic acid, and reducing gold and alkaline copper solution. The residue evaporated to dryness with strong nitric acid gives a blood-red coloration with potassium cyanide and hydroxide.

The Aloin of Jafferabad Aloes, and Observations on Aloins in General. W. A. Shenstone. (*Pharm. Journ.*, 3rd series, xiii. 461.) The author records a series of experiments, the results of which leave no doubt that the aloin of Jafferabad aloes is identical with that of Zanzibar aloes, though the colour of the former is distinctly a lighter shade of yellow than that of the latter.

Up to the present time four aloins have been examined somewhat minutely, viz., those known as barbaloin, zanaloin, nataloin, and that which is the subject of the present communication. In addition socaloin has been partially examined, and is believed to be identical with zanaloin.

As the adoption of a new name for every fresh variety of aloin examined is likely to be a source of some inconvenience, and as there is an obvious advantage in adopting a nomenclature which will group together those aloins which are most nearly alike, and also because the aloins seem likely to fall into a few groups, the author throws out the following suggestions:—

Since nataloin differs so distinctly from all the rest, it will be convenient to retain that name for that substance.

And since zanaloin, socaloin, and Jafferabad aloin differ so little from barbaloin, they may be conveniently classed together as "barbaloins," distinguishing the aloin of Barbadoes aloes—which was first discovered, and differs in a few particulars from the others—as α -barbaloin, and the later discovered aloins, between which no distinct differences are known, as β -barbaloin. The main points of difference among these bodies could then be tabulated thus:—

1. Nataloin, obtained from Natal aloes, yields only picric and oxalic acids by treatment with nitric acid; it is not reddened, even on heating, by that reagent.

2. Barbaloins yield chrysammic, aloetic, picric, and oxalic acids by treatment with nitric acid.

They may be divided into—

(a) α -Barbaloin, obtained from Barbadoes aloes, is reddened in the cold by ordinary strong nitric acid.

(b) β -Barbaloin, obtained from Socotrine, Zanzibar, and Jafferabad aloes, is not coloured by cold nitric acid, but gives an orange-red coloration when heated with it, and also gives a coloration in the cold with fuming nitric acid.

Bulgarian Opium. (*Pharm. Zeitschr. für Russland*, 1882, 747-752; *Amer. Journ. Pharm.*, 1882, 626.) The cultivation of the opium poppy in Bulgaria has been introduced under the auspices of the Medical Council and of the Secretary to the Treasury, the latter having distributed seeds as late as 1879. A Teegarten reported in 1881 (*Amer. Journ. Pharm.*, 1881, 307) on the opium obtained in the Lowtscha district in 1880. Since that time several Macedonians who were practically acquainted with the preparation of opium were engaged, and the author now describes the following samples thus obtained.

Opium from Kuestendil is in hemispherical cakes, weighing from 120 to 300 grams. While still soft the opium is formed into balls, which are laid upon grape-vine leaves and covered with the same leaves, so as to leave the sides free. The cakes have an exceptionally strong narcotic opium odour, are externally brown, internally lighter, very dry (moisture, 7.63 per cent.), and show upon the fractured surface a large number of small tears of the size of a millet grain to that of a lentil. The taste is very bitter; water takes up nearly two-thirds of the weight of the opium, yielding a clear brown solution of an acid reaction, and acquiring a dark red colour with ferric chloride. The ash amounts to 2.69 per cent.

Opium from Lowtscha is in irregular oblong or quadrangular cakes, weighing 100 to 200 grams, and covered with green leaves; the tears upon the fracture are less distinct, and the powder is of a lighter colour than the preceding. Moisture, 10·39; ash, 2·36 per cent.

Opium from Hatitz is in round, somewhat convex cakes, about 13 centimeters in diameter, and 2 centimeters thick near the centre. The cakes are covered with small leaves and are of a rather light brown colour; the aqueous solution is of a lighter colour, has a less distinct acid reaction, and filters less readily than the two preceding samples. Moisture, 10·86; ash, 2·85 per cent.

Calculated for dry opium, the different varieties yield for 100 parts:—

	Kuestendil.	Lowtscha.	Hatitz.
Ash	2·63	2·63	3·2
Morphine	20·73	13·28	8·13
Other principles soluble in water .	47·54	50·58	40·85
Insoluble in water	31·73	36·14	51·02

Opium Denarcotisatum. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 221.) This preparation, now officinal in the U. S. Pharmacopœia, is obtained by repeatedly exhausting powdered opium with ether, drying the residual powder, and mixing it with sufficient sugar of milk to bring it up to the original weight.

The object of this process is to deodorize the opium, and to free it from narcotine and other alkaloids soluble in ether, the effects of which are not desired. Besides these, the process removes 2 per cent. of fat, 4–6 per cent. of resin, and about 6 per cent. of a caoutchouc-like body, all of which may be regarded as objectionable constituents.

Assay of Opium. E. Mylius. (*Zeitschr. für. Analyt. Chem.*, 1882, Part 4; *Chemical News*, 1883, 118.) Into each of two test-tubes fitted with corks are put 5 drops of concentrated solution of iodic acid, then 5 c.c. of rectified carbon disulphide. Lastly, into one tube are put 10 c.c. of a solution of pure morphine, and into the other 10 c.c. of an extract of the sample. The tubes are corked, and both tubes are shaken up for exactly the same time, two to three minutes. The colours are then compared. If both are equal the opium contains 10 per cent. morphia. If they are unequal, the more deeply coloured solution is let down with carbon disulphide till the colours are equal. The proportion of morphine is then deduced from the volume of the liquid, which is readily seen when graduated tubes are used. The solution of morphine taken as a standard is made by dissolving 0·1 gram morphine with 3 grams

dilute sulphuric acid in 100 c.c. water. For extracting the sample, 0.5 gram in powder is boiled with 10 grams water in a 50 c.c. flask, mixed with 3 grams basic lead acetate, made up to 50 c.c. with cold water, well shaken up, filtered, and the entire filtrate precipitated with 15 drops sulphuric acid. The liquid is filtered again, and must be absolutely clear.

Opium Assay. (*Repert. Analyt. Chem.*, 1882, 284.) The following method has been agreed upon by the Société de Pharmacie of Paris: Of the sample to be tested, 15 grams are intimately mixed with 9 grams calcium hydrate, and 150 c.c. water are added, with constant rubbing, in small portions at a time, the whole being well shaken for about half an hour. The mass is then thrown upon a filter, and 100 c.c. of the filtrate, accurately measured, are introduced into a closed vessel. To this, 20 c.c. ether are added with constant shaking, and then 6 grams of ammonium chloride are dissolved in the solution, the whole agitated, and allowed to remain at rest for two hours. After that period the ether may be drawn off, and replaced by a second quantity of fresh ether, after whose removal the precipitate of morphia may be collected upon a tared filter, washed with distilled water very carefully, dried, and weighed. The weight of the dry precipitate multiplied by 10 shows the percentage of morphia in the sample.

Constituents of Kino. A. Kremel. (*Pharm. Post*, 1883, No. 11.) The author has examined Malabar Kino, Butea gum, eucalyptus kino, and kino from *Coccoloba uvifera*, and found them all free from kinoin discovered by Etti (see *Amer. Journ. Pharm.*, 1872, 6000); instead of a body acquiring, like kinoin, a red colour with ferric chloride, protocatechuic acid was obtained, alone or mixed with gallic acid.

The presence of pyrocatechin in kino has been observed by Eichstedt, Flückiger, and others (see *Amer. Journ. Pharm.*, 1872, 210). Prensse ascertained that pyrocatechin is extracted by ether from an alkaline solution, while for the extraction of protocatechuic acid, the solution requires to be acidulated. Following this process, Kremel proved the absence of pyrocatechin from the above-named varieties of kino; the ether residue was amorphous, insoluble in hot water, and the alcoholic solution without action on ferric chloride. But from the acidulated solution of Malabar and eucalyptus kino, ether took up a crystallizable body, of acid reaction, which in aqueous solution, like pyrocatechin, was coloured green by ferric chloride; sodium bicarbonate added to this caused a violet colour; the crystals were, therefore, protocatechuic acid.

Butea gum and coccoloba kino treated in the same manner yielded crystals of neutral reaction, becoming green by ferric chloride; but on the further addition of sodium bicarbonate, ferric hydrate was precipitated. The nature of these crystals could not be determined for want of material.

The different kinds of eucalyptus kino examined, yielded from ether, besides protocatechuic acid, also a body the aqueous solution of which acquired, after the addition of sodium carbonate, gradually an emerald green colour, which on the addition of hydrochloric acid turned red, and finally became decolorized; these reactions prove the absence of gallic acid.

On preparing kinic red by Etti's process from eucalyptus kino, extracting the product with ether, fusing it with caustic potassa, dissolving in water, acidulating and extracting with ether, Kremel obtained a considerable amount of protocatechuic and gallic acid.

American Storax. F. A. Flückiger and W. v. Miller. (*Archiv der Pharm.* [3], xx. 646-648, and 648-651.) The authors consider that the storax from Asia Minor is identical with that from the Mexican *Liquidambar styraciflua*, but when growing in the United States the tree does not give so good a yield. The gum then appears in the market as "sweet gum," is mixed with benzoic acid, and is harder than the ordinary *Styrax liquidus*. Miller has made analyses of American storax, and found it to contain a styrolene, whose bromine compound melted at 73°; besides the styrolene, oxygenated compounds were present, viz., styracin and phenylpropyl cinnamate.

Purification of Storax. O. Schlickum. (*Pharmaceut. Zeitung*, 1883, xxii.) The following method is recommended by the author as preferable to the purification with benzol, as well as to that with hot alcohol:—

100 parts of storax are gently heated and then gradually mixed with 10 parts of alcohol; the mixture is allowed to cool, after which an equal volume of ether is added, and the whole passed through a covered plaited filter. The residue is washed with a little ether, the entire filtrate distilled to recover the ether, and the residual storax heated on a water-bath until the odour of ether has disappeared. Good storax yields 70 per cent. and upwards of purified product.

Adulteration of Balsam of Peru. O. Schlickum. (*Archiv der Pharm.* [3], xx. 498-517; and *Journ. Chem. Soc.*, 1882, 1339.) The author has examined the means for detecting and estimating

the following adulterants:—Castor oil, balsam of copaiva, purified storax, alcoholic solutions (of a balsamic consistence) of benzoin and of colophony.

The sp. gr. is of great importance. The sp. gr. of genuine balsam of Peru being 1.140–1.150, and that of all the above adulterants being less.

Trials with various solvents showed that alcohol was of no use. Carbon bisulphide, however, gave better results. Treating 1 part of the bodies under consideration with 2 parts of carbon bisulphide, balsam of Peru gave 16 per cent. of resinous residue; storax solution of colophony, balsam of copaiva, and castor oil, dissolved completely; and benzoin gave a 60 per cent. residue.

On treating 1 gram of the above substance with 0.3–0.4 gram dry calcium hydroxide, and treating with water on the steam-bath for three or four hours, benzene extracted from the residue: from balsam of Peru, 41 per cent.; from purified storax, 35 per cent.; from balsam of copaiva, its essential oil; and scarcely anything from castor oil, or solution of benzoin or colophony.

On shaking an ethereal solution of balsam of Peru with aqueous ammonia (0.96 sp. gr.), two yellowish brown layers are obtained, with brownish flocks floating between them. The upper layer is an ethereal solution of the balsam, and gives, on evaporation, as residue, about 80 per cent. of the original balsam. On acidifying the lower ammoniacal layer with acetic acid, it becomes milky, the turbidity disappears when it is boiled, but on cooling, it again becomes turbid from separation of cinnamic acid. The benzoin solution behaves in a similar manner. Castor oil is so completely dissolved by the upper layer, that scarcely anything separates on acidifying the lower. The resin in solution of colophony and balsam of copaiva combines with the ammonia, so that on acidifying and boiling much solid resin separates. With purified storax no separation of the fluid into two layers takes place, but a stiff glue is formed, which will scarcely flow from the glass.

On treatment of 1 gram of the substances with 1 gram of sulphuric acid, and subsequent washing, first with hot and then with cold water, a solid brittle mass is formed (except with castor oil), which in the case of balsam of Peru, balsam of copaiva, and colophony is completely, and with storax and benzoin only partly, soluble in ether. In the case of castor oil a greasy mass, perfectly soluble in ether, is produced. The residue in the case of the benzoin is completely soluble in alcohol or acetone, but the resin from storax leaves a residue (about 7 per cent. of the original storax), called styro-

genin by E. Mylius, who found its composition to be $C_{26}H_{40}O_8$. This body was first observed by the author (*Pharm. Zeitung*, 1881).

The above properties of the different adulterants are utilized by the author for their detection and quantitative estimation.

The Testing of Copaiba. Dr. H. Hager. (*Pharm. Centralhalle*, 1882.) The thick copaiba balsam, officinal in Germany, has a peculiar relation to 90 per cent. spirit of wine, which not only is a proof of good quality, but detects almost every possible falsification.

It gives a clear solution with one and often with two parts of 90 per cent. spirit. If two or three more volumes of the same spirit are added, the mixture becomes, after shaking, very turbid and almost milky.

If the balsam to be tested is mixed with a volume and a half of 90 per cent. spirit, a clear solution should result. If it is turbid, there may be present resin oil, colophony, gurjun balsam, or some fatty oil.

If the solution is clear, it is further diluted with its own volume or a volume and a half of the same spirit. It ought to become very turbid. If it remains clear, or becomes only so slightly turbid that a layer a centimetre thick does not hinder vision, the balsam is adulterated with castor oil, turpentine oil, or turpentine. Sassafras oil alone does not interfere with the relation of the balsam to the spirit.

A similar relation exists between Peruvian balsam and 90 per cent. spirit, which has already been suggested as a method of testing.

Podophyllin. C. C. Klump. (*Pharm. and Chem.*, January, 1883, 23.) The author gives the result of some experiments made upon the podophyllin resin of commerce, with the view of ascertaining if the portion soluble in ether represents the active ingredient of the resin. He found that the portion of the resin insoluble in ether did not produce purgative effects, even when taken in the dose of 2 grains; while $\frac{1}{4}$ of a grain of that soluble in ether proved purgative. One specimen examined by him contained 20 per cent.; while another, prepared according to the process of the U. S. Pharmacopœia, gave only '6 per cent. The use of alum thus increases the product by 20 per cent. of insoluble resin above the amount of soluble resin yielded by the official process.

Occurrence of Bassora Gum in {Cycadeæ. C. R. Blackett. (From the Australian Supplement to the *Chemist and Druggist*.) At the request of Baron von Mueller, the author has examined the gum exuded by *Macrozamia Fraseri* and *Macrozamia Miquelli*.

It would seem that hitherto it has not been recorded that a kind of gum is exuded by cycadaceous plants, although the abundance of a peculiar starch in the stems of the Australian *Macrozamia* has been noticed in various publications, and also in the pages of the *Chemist and Druggist* by Baron von Mueller. This gum is similar to Bassora and cherry gum, is secreted both from the stem and fruit-cones of the *Macrozamia*; in general appearance it is not unlike gum acaciæ; it is very tough, and of a brownish colour. In the experiments upon these gums from *M. Fraseri* and *M. Miquelli*, it was found that they were with difficulty fractured, and swell up and soften on being macerated in cold water, becoming transparent gelatinous masses, and not rapidly dissolving; by long-continued digestion in boiling water, the less soluble matter is gradually brought into solution; the clear solution dried at 100° C. forms a clear and hard gum, adhesive to the touch of the slightly moistened finger. The addition of potassium hydrate renders the gum readily soluble, but darkens the colour considerably. In water acidulated with H_2SO_4 , it is soon dissolved, and a flocculent precipitate is formed, and after boiling for a short time the presence of sugar was detected on the addition of Fehling's copper test; absolute alcohol produced only a slight turbidity in the aqueous solution. The latter will keep undecomposed for several days, and dries up very slowly; therefore this gum, even if more adhesive, could not be used as a substitute for gum arabic. Ferric chloride produces no action upon the solution whatever. The ash yielded was found to be equal to 1.75 per cent., and composed of lime, iron, sodium, potassium, carbonic acid, sulphuric acid, and chlorine.

This gum is therefore analogous to Bassora gum, or tragacanth, and similar gummous exudations of plants; whether it can be used instead of gum tragacanth has yet to be tried. This gum was not found to possess any of the deleterious acidity which pervades the sap of the cycads generally, and which renders their fruit, in a raw state, poisonous.

Gum of Bassora is white and honey-coloured, mealy, and silvery on its surface, and in the form of somewhat flattened and elongated masses. It is insipid, and crackles between the teeth. In water it swells up to a transparent jelly, but only a small portion dissolves. The soluble portion contains arabin, amounting to about 1 per cent. of the gum; the insoluble portion contains bassorin. It dissolves with the aid of heat in potash and weak acid.

Chinese Camphor. F. Newcome. (*Medical Press and Circular*, August 2nd, 1882.) In China camphor is grossly adulterated with

a glue obtained by boiling a rattan creeper, locally called T'êngtsai. This weed, growing luxuriantly in the interior of Formosa, from whence all Chinese camphor is derived, is full of a glutinous matter which boiling water converts into a colourless glue. Mixing this with the pure camphor and a small percentage of water prevents evaporation, though naturally destroying the high quality of the article itself. Camphor so adulterated will keep, it is said, for a couple of months without loss; indeed, will bear the journey to Europe without suffering appreciable diminution. Experiments recently made have demonstrated the existence of two parts of glue to three of camphor in certain samples offered in the Tamsui market, rendering the article absolutely useless.

Very little of the camphor manufactured in Formosa is consumed by the Celestials, nearly all being shipped to foreign countries. On the other hand, they continue importing for their own use the more precious natural article secreted by the *Dryobalanops camphora* of Sumatra and Borneo. For these concrete masses, commonly known as Camphor Baroos, fancy prices are still paid: 31s. a pound was the import price at Ningpo last year. Of this fine camphor but a small quantity finds its way to Europe; the relative cheapness of the manufactured article driving it quite out of the markets, although it is well known the native manufacturers in Formosa place no special reliance on their own product, which, they say, possesses little or no virtue.

Oil of Gaultheria. W. P. Underhill. (*Amer. Journ. Pharm.*, April, 1883.) The author, who has distilled this oil since 1874, gives the average yield as 10 pounds from a ton of the leaves, the highest yield being 14, and the lowest 9. The larger yield is obtained when the season is dry. The cost of the leaves delivered at the mill is $1\frac{1}{2}$ cents per pound, and it is very difficult to obtain leaves at that price. Since it will require about 200 pounds of leaves to make 1 pound of oil, the cost of the latter is 3.00 dollars for the leaves alone. The author does not believe that the large, sleazy leaves of New Jersey yield more oil than the stiff, hard and brittle leaves of New Hampshire.

Aconite Root. Dr. Squibb. (*Pharm. Journ.*, 3rd series, xiii. 343.) The author gives some valuable results obtained by himself in experiments with aconite (*Ephemeris*, i. 123). He considers it a good test of the quality of the root, if eight out of ten roots, broken across the middle, give a tingling taste when a minute fragment is bitten off and chewed for a moment between the front teeth. He remarks concerning the alkaloids that pseudaconitine

has a less tingling taste and more of a peppery heat in it, and is about ten times stronger than aconitia. In one European specimen of aconitine, the taste was so bitter that Dr. Squibb believed it to consist chiefly of a decomposition product, picroaconitine. The relative strengths of four samples of alkaloids compared by him with a standard solution were as follows: Aconitia of unknown maker, 1; Merck's aconitine, 8; Merck's pseudoaconitine, 83; Duquesnel's aconitine, 111. He further remarks that the last-mentioned produces a very different impression on the mouth from that of either of the other aconitias, and from that of the root of *A. Napellus*, causing in a greater degree the tingling element, which commences almost immediately, while that of pseudoaconitia is delayed from five to ten minutes. It also diminishes rapidly, which is not the case with pseudoaconitia. The paper is full of valuable information, and deserves a careful perusal.

Constituents of Galanga Root. E. Jahns. (*Archiv der Pharm.*, cccx. 161.) The author has isolated the following compounds from the galanga root: Kämpferid, $C_{16}H_{12}O_6 \cdot H_2O$, crystallizing in yellowish needles (m. p. 221°) which are slightly soluble in water, ether, and benzene, freely soluble in alcohol, soluble in alkalies to an intensely yellow solution and in concentrated sulphuric acid to a yellow solution, with a strong blue fluorescence. *Galangin*, $C_{15}H_{10}O_6 \cdot H_2O$, crystallizing from its solution in aqueous alcohol in yellowish white needles (m. p. 214°). The reactions of this body are very similar to those of kämpferid; its solution in concentrated sulphuric acid, however, is non-fluorescent. *Alpinin*, $C_{17}H_{12}O_6$, crystallizes in yellowish needles (m. p. 173°). Its reactions are similar to those of galangin.

The Specific Gravity of Jalap. Dr. H. Hager. (*Pharm. Centralhalle*, 1882, No. 27.) In order to determine the specific gravity of jalap, the author took five tubers of similar appearance, and threw them into water, when all but one sank under. Resin and sugar, which are present in the tubers, render them heavier than water. The sp. gr. of the resin is 1.15–1.16, and that of sugar 1.5–1.6. The tubers which sunk in water were found to have a sp. gr. of 1.150–1.180. Hence the minimum specific gravity may be put at 1.140, and the pharmacist should reject any jalap having a lower gravity.

The determination is best made by means of a solution of common salt having the sp. gr. 1.140–1.142; and the requirement is that at least ninety tubers out of every hundred should sink in this liquid.

To prepare such a solution, two hundred grams of dry commercial

table salt are dissolved in 1.055 c.c. (or grams) of water. About fifty tubers are then immersed in this liquid, while being stirred, at a temperature of 15–17° C. Should some of the tubers be retained on the surface by numerous adhering air-bubbles, it is only necessary to rub them with the finger, when they will readily become wet. After examination, the tubers are put into a sieve, washed off with water, and dried with a linen cloth.

Although it is stated above that 1.140–1.142 may be set down as the lowest permissible specific gravity, it will probably be found, on further examination, that the limit may be raised to 1.150.

Jalap. W. Coblentz. (Abstract of an inaugural essay; *Amer. Journ. Pharm.*, 1882, 385.) Commercial air-dry jalap of fair quality was examined.

1. *Moisture*.—5 grams of jalap, heated to 100° C. until it ceased to lose weight, lost .388 gram = 7.76 per cent.

2. *Ash*.—5 grams of jalap on incineration yielded .5508 gram = 11.016 per cent. of ash, of which 35.29 per cent. was soluble in water, 38.23 per cent. soluble in hydrochloric acid, 8.82 per cent. soluble in soda, and 17.64 per cent. insoluble. The ash consisted of sulphates, phosphates, chlorides, and carbonates of potassium, sodium, calcium, and magnesium, and silica.

3. *Benzol Extract*.—50 grams of jalap, exhausted with pure benzol, yielded 9.331 gram = 18.62 per cent. of extract of a yellowish brown colour, a nauseous smoky odour, and sweetish acid taste; dissolved in absolute alcohol, and the solution precipitated by water, it gave 8.035 gram = 16.07 per cent. of resin, and on evaporation of the aqueous liquid, .648 gram of yellowish brown sweetish extract, which contained sugar, was free from tannin, and yielded a yellowish precipitate with basic lead acetate. The resin was ascertained to be insoluble in oil of turpentine, sparingly soluble in petroleum naphtha and methylic alcohol, soluble in alcohol, amylic alcohol, chloroform, and acetic acid. On being repeatedly dissolved in alcohol and precipitated in water, it became white and almost inodorous.

4. *Resin*.—On exhausting the resin with strong ether and evaporating, .41139 gram = 5.12 per cent. of a soft resinous mass was obtained, having a greenish brown colour, a disagreeable acid taste, and the peculiar odour of jalap; its alcoholic solution has an acid reaction; its solution in caustic alkali is red-brown and is precipitated by hydrochloric acid.

The resin insoluble in ether weighed 7.624 grams = 94.88 per cent. Its alcoholic solution is neutral to litmus; its solution in

potassa is bright yellow and is not disturbed on the addition of an acid. With nitric acid the resin evolves nitrous oxide and is coloured bright yellow. Among the products of oxidation oxalic acid is found.

5. *Alcoholic Extract*.—The drug exhausted with benzol was treated with 80 per cent. alcohol; on evaporating the tincture, 5.508 grams = 11.016 per cent. of a red-brown tough extract was obtained; of this .912 gram = 16.5 per cent. was soluble in absolute alcohol, and this portion had an acid reaction, reduced Fehling's solution, was free from tannin, and was partly precipitated by subacetate of lead.

The portion insoluble in absolute alcohol was entirely soluble in water and was partly precipitated by basic lead acetate.

6. *Cold Water Extract*.—Cold water took up from the drug 2.59 grams = 5.18 per cent. of extract, consisting of gum and colouring matter.

7. *Starch* was estimated by boiling the root with water, and this extract for a long time with dilute acid, and calculating from the glucose; the amount was 3.6 grams = 7.2 per cent.

8. *Alkali Extract*.—Boiling dilute soda solution dissolved 1.29 gram = 2.58 per cent. of albuminous and colouring matters.

Powdered Jalap.—Twelve samples were assayed for the resin, which was found to vary from 3.8 to 16.2 per cent., the average being 8.1 per cent.; this resin was not further examined.

Chinese Rhubarb. F. Newcombe. (*Medical Press and Circular*, Aug. 2nd, 1882.) Rhubarb grows wild in all the northern and western provinces, yet nowhere does it seem to be brought under cultivation, invariably being found in a wild state. Several varieties of rheum plant are indigenous to China, some being inestimably valuable, and others almost worthless. Shênsi roots are by far the most esteemed, those coming from the Kanchow district being perhaps the more prized of all. This rhubarb, the best in the market, can be readily distinguished from other kinds. The roots are large, smooth, and extremely fragrant; whereas those obtained in the province of Szechwan are smaller, rough on the exterior, deficient in flavour, and when cut give out little scent. Best Szechwan rhubarb commands only about one half the price asked for Shênsi rhubarb, while inferior qualities fetch from one-tenth upwards. In this connection it is interesting to note how strongly many Chinese hold by the belief in the utter inefficacy of roots grown in the southern provinces, which, according to their theory, are only good to sell to the English barbarians. As a fact,

Russian merchants look at no rhubarb that does not bear on its face evidence of a northern derivation. In this, unfortunately, they are not imitated by their English rivals, who buy anything that is offered, so long as the price is sufficiently tempting or holds out a prospect of additional profit. This points to the necessity of medical men and retail druggists exercising extreme care in the selection of their rhubarb, and perhaps more important still, to buy only of persons in whose judgment and honesty they can place entire dependence.

Another good sample arrives at Tientsin from Hsining, in Kansuh, after which town it takes its name. Chungch'i rhubarb is also greatly prized, while Chichuang, Taibuang, and Shanhuang, are about as worthless as well can be. Doubtless, however, as Mr. Detring remarks, a considerable percentage of inferior rhubarb is nothing more than dock-plant root, sold under the fashionable name. Upon the properties of this sham we cannot speak authoritatively, but quite likely it possesses properties similar to those of the yellow dock and other European species of this order. The greater part of this rubbish is bought for the English market. The other producing districts besides those mentioned above are Chihli, Honan, and different parts of Thibet, from whence several very fine varieties, formerly sent overland, *via* Kiakhta through Russia, are obtained.

Moravian Rhubarb. (*New Remedies*, Sept., 1882.) The culture of *Rheum compactum* in Moravia was commenced, in the beginning of the present century, by Prikryl, apothecary in Austerlitz. Until about twenty-five or thirty years ago the root was largely exported to Lyons and Milan, where it was used for dyeing silk. With the use of chemicals for dyeing, the price of this rhubarb receded to about ten florins per hundredweight, but more recently has advanced again, and is about one florin per pound for triennial roots. This rhubarb is again largely exported, chiefly to Russia, whence it is exported again as Asiatic rhubarb. Professor Dr. A. Vogl has pointed out histological differences by which this article may be distinguished from Chinese rhubarb; but a correspondent insists that even in this respect it will resemble the latter much more closely if permitted to remain in the ground for five or six years. The commercial article is said to yield extracts, tinctures, and infusions, which, not only in colour, odour, and taste, but likewise in activity, compare favourably with the corresponding preparations of Chinese rhubarb. The author urges the employment of this rhubarb, partly for patriotic reasons as far as Austria-Hungary is concerned, but chiefly on account of its low price and its good

effects, these being fully secured if five parts of Moravian rhubarb be used in place of four parts of the Chinese root, as was pointed out already, in 1808, by Trommsdorff.

Mahomic Aquifolia, s. Berberis Aquifolia. Dr. J. Moeller. (*Pharm. Centralkalle*, 1882, 356, 357. From *Amer. Journ. Pharm.*) The author has submitted the root (stem?) to a microscopical examination, with the following results:—

The wood shows scarcely an indication of annual layers. The ducts are variable in size, rarely exceeding 0.1 mm., scattered, frequently several united tangentially, the terminal wall perforated, the lateral well densely dotted and occasionally spirally striate; the wood parenchyma is scanty.

The young bark has no sclerotic cells; in older bark the parenchyma becomes thick-walled, forming layers resembling concentrically arranged bast layers; but bast fibres are entirely absent, and the parenchyma is short, rarely forming more than three layers. The primary medullary rays are composed of 10 or 15 rows of cells, and widen gradually to a layer of 1 m.m., or more. Later on secondary medullary rays are formed singly in each bark ray, and attain, centripetally, considerable width. The inner cell-groups of the medullary rays become sclerotic without changing size or shape. The middle bark consists of thin-walled, tangentially elongated parenchyma, and is covered by delicately flat-celled cork.

The parenchyma contains a golden yellow substance soluble in water, while the sclerotic cells of the wood and bark retain the colour. Berberine nitrate could not be obtained by Bodeker's microchemical reaction; only traces of calcium oxalate are present, and crystals are rarely observed; but sulphuric acid causes the separation of a few needles of calcium sulphate. Starch is absent, indicating that the root is collected in summer.

Relation between Starch and Atropine in Belladonna Root. F. Buddell. (*Archiv der Pharm.* [3], xx. 414.) Belladonna roots containing starch always contain a larger proportion of atropine than those in which starch is absent. The roots of young plants contain little or no starch. As the plant ages the starch increases, and with it the percentage of alkaloid.

The Root of Ionidium Ipecacuanha as an Adulterant of Senega. Prof. Charbonnier. (*Journ. de Pharm. et de Chim.*, 1883, 44.) The author has met with senega root adulterated with 15 per cent. of the root named. The latter occurs in greyish white pieces about 5 to 6 centimeters long, and of the thickness of a goose quill. It is irregularly undulated, branched below, and beset with small remnants of ligneous stems above. It is strongly wrinkled longitudinally.

dinally, and irregularly fissured transversely; the cortical substance is thin and adheres firmly to the yellowish medullium.

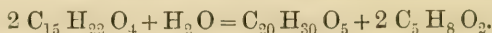
Megarrhiza Californica, Torrey. W. M. Young. (*Proc. Cal. Coll. Pharm.*, 1883, 52.) The root of this cucurbitaceous plant has been examined by J. P. Heaney (see abstract, *Year-Book of Pharmacy*, 1877, p. 197). The bitter glucoside, *megarrhizin*, has been recently prepared in a purer state by the author; its decomposition-product, now named *megarrhizein*, was obtained in white feathery crystals soluble in hot water, alcohol, and chloroform, insoluble in ether and cold water; it is purgative in doses of $\frac{1}{4}$ grain.

The author found also a second glucoside, *megarrhin*, which resembles saponin, and possesses the property of dilating the pupils; also two resins, one soluble in alcohol and the other soluble in ether.

The Bitter Principle of Laserpitium Latifolium. Dr. R. Külz. (*Chem. Zeitung*, 1883, 455.) The root of this plant, known as white gentian root, contains a bitter principle, *laserpitin*, which is obtained by repeatedly extracting the finely divided root with petroleum ether, concentrating the filtered liquid by distillation, and allowing the residual liquid to evaporate and crystallize. The crystals are purified by recrystallization from boiling petroleum ether, and then form large colourless crystals of the monoclinic system, having the composition $C_{15}H_{22}O_4$, and melting at $113^{\circ}C$.

Upon heating laserpitin with sodium acetate and an excess of acetic anhydride, the acetyl derivative, $C_{15}H_{21}(C_2H_3O)O_4$, is obtained, which crystallizes in short, thick, colourless needles melting at $118^{\circ}C$.

By the action of KHO , laserpitin is split into laserol and angelic acid. The former could be obtained only as a brown resinous mass; the decomposition is presumed to occur according to the equation:—



Cuprea Bark. G. Körner. (*Pharm. Journ.*, 3rd series, xiii. 246; and *Journ. Chem. Soc.*, 1883, 66.) The bark employed differs from ordinary cinchona bark, in that its aqueous solution becomes reddish violet on the addition of potash, and moreover, it yields caffeic acid when employed for the manufacture of sulphate of quinine; the caffeic acid is found in the mother-liquors as quinine caffeate. The author has obtained the acid from the bark by the following process, the yield being about 0.5 per cent.:—The powdered bark is first extracted with ether and then thoroughly with boiling alcohol. The latter extract is evaporated to dryness, and the residue treated with $2\frac{1}{2}$ times its weight of boiling water and its own

weight of potash; the whole is then boiled for three hours, super-saturated with dilute sulphuric acid, filtered hot, and extracted with ether. This extract is concentrated until crystals form. The crystals are well washed with small quantities of ether, and are purified by boiling with animal charcoal and recrystallizing. They form brilliant, hard, yellowish tables, with 4.8 per cent. water of crystallization. From acetic acid they separate in crusts of opaque nodules, which decompose without melting at 212° , and have the formula $C_9H_8O_4 + \frac{1}{2}H_2O$, and they give the characteristic reactions of caffeic acid. Dimethylcaffeic acid and methylic dimethylcaffeate were prepared from the acid and identified.

The presence of this acid furnishes an additional proof of the relationship existing between the coffee and cinchona plants.

Cuprea Bark. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xvi. 58-63.) The author has previously shown (*Ber.*, iv. 818) that this false cinchona bark contains cinchona alkaloids, and that it answers to the same tests as the genuine barks (*Annalen*, clxvi. 218). It has several times appeared in the market, and is now found in enormous quantities in London. A microscopic examination has satisfactorily shown that it is derived from *Remijia pedunculata*, as stated by Triana. It contains quinine, quinidine, cinchonine, and amorphous bases, but no cinchonidine or paricine. By the action of permanganate in acid solution on the quinine, quinidine, and cinchonine, small quantities of the hydro-bases are produced. On boiling the amorphous bases with water, cincholine is obtained, and also diquinidine, $C_{40}H_{46}N_4O_3$; the platinochloride of this base, $C_{40}H_{46}N_4O_3, 2H_2PtCl_6 + 4H_2O$, forms a dense yellow powder. Certain other barks have at different times appeared under the name of cuprea bark, as for instance, *Buena magnifolia*, *Remijia purdicana*, etc. The base contained in cuprea bark, which in composition and certain properties resembles cusconine, differs from the latter in the following properties:—it melts at 144° (instead of at 110°), crystallizes with 1 mol. H_2O (cusconine with $2H_2O$), dissolves with greater difficulty in cold alcohol, and turns the plane of polarised light to the right, cusconine being lævorotatory. This *concusconine*, therefore, bears the same relation to cusconine that quinidine does to quinine. The base previously assumed to be aricine is found to be a distinct body, and of different composition, $C_{19}H_{24}N_2O$. It melts at 184° , is dextrorotatory, and turns red litmus blue. Its solution in sulphuric acid does not fluoresce; with chlorine and ammonia, no green coloration is produced. The platinochloride, $(C_{19}H_{24}N_2O)_2, H_2PtCl_6$, forms a yellow flocculent precipitate. The normal sulphate, $(C_{19}H_{24}N_2O)_2,$

H_2SO_4 , crystallizes in prisms sparingly soluble in alcohol, readily in water. The body formed by oxidation with acid permanganate is probably identical with Arnaud's cinchonamine. Another base contained in cuprea bark is *concusconidine*, $\text{C}_{23}\text{H}_{26}\text{N}_2\text{O}_4$, corresponding to cusconidine. It melts at 124° , and is an amorphous yellowish white powder. The platinochloride, $(\text{C}_{23}\text{H}_{26}\text{N}_2\text{O}_4)_2 \cdot \text{H}_2\text{PtCl}_6 + 5\text{H}_2\text{O}$, forms an amorphous flocculent precipitate.

Cuprea Bark. Prof. G. Planchon. (*Pharm. Journ.*, 3rd series, xiii. 183, from *Journ. de Pharm.*) The author throws some fresh light on the source of this bark. A microscopical examination of the specimens supplied to him by M. Triana showed that the barks derived from Bucaramanga, in the north, and from Llanos, the southern district, both present the same characters and are evidently both furnished by *Remijia pedunculata*. The cinchonamine bark of M. Arnaud presents different microscopical characters, and is referred by M. Planchon to *R. purdieana*. He remarks that a microscopical examination has never yet deceived him in the solution of like problems. A singular confirmation of the value of this method of research occurs in the form of a postscript to M. Planchon's article, in which he states that since it was written, M. Triana has received information to the effect that the cinchonamine bark does not come direct from Bucaramanga, but only passes through it, being collected near Antioquia, on the other side of the Magdalena river. Further, that a large exporter of the cuprea bark has recognised the southern bark as the produce of *R. pedunculata*.

Résumé of Various Methods for Determining the Total Alkaloids in Cinchona Barks. H. Meyer. (*Archiv der Pharm.*, Nov. 27th, 1882. From *Chem. and Drugg.*) The author has carefully examined and compared the various methods in vogue for determining the total alkaloids in cinchona barks, and has further worked out a new method of his own. The following is a *résumé* of his investigation:—

1. When finely-powdered cinchona bark is boiled for an hour with freshly-prepared milk of lime and 90 per cent. alcohol, the whole of the alkaloids present in the bark is brought into solution.

2. Previous maceration with dilute sulphuric acid or alcohol acidulated with this acid is only useful in cases of imperfect extraction, as in the method of Prollius (see the *Chemist and Druggist*, 1881, 397) and does not yield better results than the extraction with milk of lime.

3. In the separation of the alkaloids themselves, repeated extraction by agitation with the solvent is far preferable to precipitation.

4. The separation of chinovic acid, chinovine, and a certain wax-like fat may be effected without loss by mixing the alcoholic infusion, previous to evaporation, with an excess of sulphuric acid, and then evaporating gradually under constant stirring. The above substances are then found in a state of fine suspension in the liquid, and admit of being completely washed out.

5. Only by means of protracted decoction and displacement of the cinchona lime is it possible to extract the entire amount of alkaloids present in the bark operated on.

6. According to H. Meyer's modified lime-alcohol method, the total percentage of alkaloids in a given bark may be ascertained in twelve hours, or with ease in two days.

7. All other methods of extracting the cinchona powder, either by means of dilute acids (De Vrij, Hager), mixtures of chloroform, and glacial acetic acid (Eykmán), or chloroform, alcohol, and ammonia (Prollius), are imperfect, a considerable quantity of alkaloids always remaining in the bark.

8. The methods of Professor Gunning and Prollius give too high results, for impurities, such as calcium chinovate, chinovine lime, and a wax-like fat, are thereby reckoned among the alkaloids, and calculated as such.

The following table will afford a view of the results obtained by the various methods. The figures represent in part the average of a number of analyses.

Method.	Percentage of Pure Alkaloids.		
	Cort. Cinch. Succirubr. Javaneus.	Cort. Cinch. Calisayæ.	Cort. Cinch. Offic. (P.G.)
Hager	3·75	2·76	—
Prollius, non-modified.	6·33	—	—
Prollius, modified, without ma- ceration with acid	4·14	3·7	5·12
Prollius, modified, previous ma- ceration with acid	4·77	4·17	5·54
De Vrij.	4·60	3·86	5·85
Eykmán, chloroform, glacial acetic acid.	4·72	3·9	5·81
Gunning, non modified	8·12	—	—
Gunning, modified.	5·16	—	—
Meyer	5·4	4·6	6·57
Meyer, maceration with 2 per cent. sulph. acid.	5·42	4·59	6·67
Meyer, maceration with 90 per cent. alcohol and sulph. acid.	5·38	4·61	6·65
Meyer, maceration with 50 per cent. alcohol	5·4	4·57	—

Various Methods of Assaying Cinchona Barks. (*Zeitschr. für Analyt. Chem.; Chemical News*, xlvii. 240.) Prollius shakes up 5 grams powdered bark with a mixture of 38 parts alcohol, 10 parts chloroform, and 2 parts ammonia, in a stoppered flask; decants off the liquid after some hours as clear as possible, and mixes them with 5 parts finely powdered hydrate of lime, which at once decolorizes the vinous red liquid, whilst the alkaloids remain in solution. The liquid is filtered, weighed, and gradually evaporated, when the quinine remains in a varnish-like state, but the other alkaloids as crystals. The weight of the residue gives the percentage of the bark in alkaloids.

For determining the quinine and the secondary alkaloids soluble in ether, Prollius recommends a mixture of 88 parts ether, 4 parts ammonia, and 8 parts alcohol. Three grams of powdered bark are digested for some hours with 30 grams of this mixture, shaking frequently. After the powder has settled, 20 grams of the solution are decanted off clear, and shaken up with 5 to 6 drops of dilute sulphuric acid, or so much that it slightly predominates. The alkaloids settle to the bottom of the vessel as an acid, thick-flowing, aqueous solution. The ether is decanted off, and the residue of the alkaloids is removed from it by agitation, first with 2 grams and then with 1 gram ammonia. The united solutions of the latter are heated to expel the alcohol, and are precipitated, whilst warm, in tared capsules, with ammonia. The precipitate is deposited in a resinous state, and is easily washed and dried.

According to H. Kissel, the last-described process is especially adapted for the rapid and accurate determination of the cinchona alkaloids, but it shows not merely the quinine and accompanying bases, but the entire alkaloids in the bark. Kissel macerates the bark with the solvent mixture for two hours, evaporates a clear aliquot part of the solution, re-dissolves the residue with a slight excess of dilute sulphuric acid and hot water, filters from the undissolved wax and quinine acid, precipitates when cold with caustic soda, collects on a tared filter, dries at 115° , and weighs.

J. E. de Vrij admits the advantages of the Prollius process, but modifies it by macerating 10 grams of very finely powdered bark with 200 grams of the solvent mixture, shaking up frequently, pours off, and weighs a part of the clear liquid; distils off the ether in a water-bath, and rinses the residue with alcohol into a tared capsule. By drying on the water-bath we obtain the crude alkaloids. These are purified by solution in dilute hydrochloric acid, filtered, and the filter is washed till the washings are no longer rendered turbid by

soda-lye. The filtrate is shaken up with chloroform and soda-lye in a separating funnel provided with a stopper and a flask. After twelve hours the stratum of chloroform which contains all the alkaloids is drawn off, the chloroform is expelled by evaporation or distillation, the residue is dissolved in alcohol, evaporated in tared capsules, dried, and the pure alkaloids are weighed.

J. Biel macerates 20 grams powdered bark with 200 grams of the solvent mixture for four hours in a well-closed flask, filters rapidly through a folded filter covered with a glass plate, and decolorizes the solution, if red, with 20 grams of finely ground hydrate of lime. One hundred grams of the filtrate are evaporated to dryness in a beaker on the water-bath, the residue dissolved with a few drops of sulphuric acid and hot water, let cool, filtered, and the filter washed. The total filtrate (about 40 c.c.) is supersaturated with ammonia in a narrow stoppered glass, and four times shaken up with chloroform, using 20 c.c. each time. The chloroform is separated from the aqueous solution by means of a separating funnel, evaporated in the beaker, the residue dried at 110° , and weighed. For accurate determinations the alkaloids must be re-dissolved in dilute acetic acid, filtered through a weighed filter, and the residual resin weighed after drying at 110° , and deducted. The process first given by Prollius yields, according to Biel, the alkaloids in a very impure state, and does not even extract their total quantity.

An Easy Method of Assaying Cinchona Bark. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, 1882, 548.) The powdered bark is exhausted with water acidified with hydrochloric acid, twice by boiling, and finally by percolation. The united filtrates are repeatedly shaken with chloroform, in order to remove the resinous and oily constituents, then rendered alkaline with soda, and again agitated with fresh portions of chloroform, which will take up the whole of the alkaloids. After allowing these chloroform solutions to evaporate in a capsule at a moderate temperature, the alkaloids are left in a tolerably pure state.

Cinchona Barks from Jamaica. D. Morris. (*Pharm. Journ.*, 3rd series, xiii. 802.) The author's report refers to specimens of leaves, flowers, fruits, and barks of cinchona sent to the Pharmaceutical Society from the Government plantations in Jamaica. These specimens comprise the following:—

1. *Cinchona officinalis*.
2. *Cinchona succirubra*.
3. *Cinchona hybrid*, supposed to be a hybrid form between *C. succirubra* and *C. officinalis*.

4. *Cinchona Calisaya*.

5. *Cinchona Ledgeriana*.

6. *Species not determined, supposed to be C. micrantha*.

Mr. J. E. Howard's analyses of the trunk bark of the trees of which some of these specimens were obtained show the following percentages of alkaloids:—

	No. 1.	No. 2.	No. 3.
Quinine.	5·18	6·00	3·70
Cinchonidine	0·22	0·73	0·60
Cinchouine.	0·11	0·10	0·35
Quinidine	0·15	0·03	0·05

Results of Analyses of Samples of *Cinchona* Bark grown in Jamaica. Dr. B. H. Paul. (*Pharm. Journ.*, 3rd series, xiii. 897.) The barks examined were portions of specimens presented to the museum of the Pharmaceutical Society by the Colonial Office. The results are tabulated as follows:—

Variety of Plant.	Kind of Bark.	Quinine.	Quinidine.	Cinchonidine.	Cinchonine.	Amorphous.	Total.
1. <i>Cinchona officinalis</i>	Trunk	3·74	0·04	1·77	0·23	0·30	6·08
	Twig	1·08	trace	·37	·60	·20	2·25
	Root	2·90	1·01	·67	4·60	·58	9·76
2. <i>Cinchona succirubra</i>	Trunk	2·04	·13	2·58	2·45	·50	7·70
	Twig	·78	—	·47	·23	·29	1·77
	Root	1·76	·34	1·39	4·40	·90	8·79
3. Hybrid?	Trunk	2·47	—	2·24	·90	·52	6·13
	Twig	1·00	—	·87	·40	·36	2·63
	Root	2·45	·57	2·02	3·54	·56	9·14
4. <i>Cinchona Calisaya</i>	Trunk	·34	·23	·82	·82	1·80	4·01
	Twig	—	—	—	—	—	1·30
	Root	trace	4·07	·45	1·80	·65	6·97
6. <i>Cinchona micrantha</i>	Trunk	1·13	·30	·67	3·24	·68	6·02
	Twig	·43	—	·28	·60	·50	1·81

The difference between these results and those of Mr. Howard quoted by Mr. D. Morris (preceding abstract), are to be accounted for to some extent by the fact that the samples analysed by Mr. Howard two years ago were specially selected portions of the richest part of the lower trunk, while those recently presented to the museum, and analysed by the author, are a fairer average representation of the bark produced for sale in Jamaica.

The large proportion of quinidine in the root bark of the "calisaya" sample is quite exceptional, and, taken together with the small

amount of quinine, may perhaps be evidence of unhealthy growth, or of the influence of unfavourable conditions of soil or climate. Possibly, however, this small proportion of quinine is attributable to the fact, recently pointed out by Mr. J. E. Howard, that the plants sent to Jamaica as "calisaya" were really plants of *C. micrantha*, var. *Calisayoides*, instead of the true *Ledgeriana*, characterised by the large amount of quinine contained in the bark. The percentage of quinine in the "succirubra" sample shows that there is a very good type of this cinchona being cultivated in Jamaica.

A comparison of the author's present results with those of analyses made by him in 1878, of some of the earliest samples brought from Jamaica by Mr. R. Thomson, leads to the inference that with further growth there has been in most instances an improvement in the quality of the bark. In the "succirubra" samples there is, on the average, more than double the amount of quinine, and in the "officinalis" samples there is also a considerable increase. In the case of the samples represented as "calisaya," however, the reverse is noticed, and this may be due to the bark having been derived from different varieties of that species.

The Effect of Altitude on the Alkaloids of Red Cinchona Bark. J. E. Howard. (*Pharm. Journ.*, 3rd series, xiii. 1013.) The author publishes a communication from Dr. Henry Trimen, containing his (Mr. Howard's) analyses of two samples of Ceylon *C. succirubra* grown at greatly different altitudes. The results of these analyses are given in the following table:—

	Quinine Sulphate.	Quinine.	Cincho-nidine.	Cincho-nine.	Quini-dine.	Amor-phous.	Total alkaloids.
A.							
Large quill, } grown at } Hakgala, } 5,500 ft. }	2.75	2.06	3.47	0.61	trace	0.66	6.80
B.							
Small quill, } grown at } Peradeniya, } 1,500 ft. }	0.62	0.47	0.05	1.67	0.30	1.06	3.55

The influence for good of elevation is strikingly seen from greatly increased production of total alkaloids. Still more interesting, however, is the effect produced on the proportion of individual alkaloids. While quinine in *B* is reduced to one-fourth of that in

A, and cinchonidine to a mere trace, cinchonine and quinidine, but chiefly the former, show a very considerable increase. The appearance of the bark from the low elevation was finer than that of *A*, notwithstanding its great inferiority in the proportion and relative value of alkaloids.

Cinchona Leaves. M. Haffenberger. (*Proc. Cal. Col. Pharm.*, 1882, 53.) The average yield of alkaloids obtained by the author was two per cent. from the leaves of *C. Calisaya*, 1·8 per cent. from those of *C. succirubra*, and 0·66 and 0·70 per cent. from *C. officinalis* and a hybrid respectively. In the calisaya leaf the bulk of the alkaloid, 4 per cent., was found in the midrib, and only 0·76 per cent. in the lamina. The alkaloids from this species consisted of quinine, quinidine, cinchonine, and cinchonidine, the quinidine constituting about one-half of the entire percentage of bases.

Aralia Spinosa. J. R. Lilly. (*Amer. Journ. Pharm.*, September, 1882.) Noticing the great differences in the results of former investigations of aralia bark, the writer performed a series of experiments, in hopes of determining the nature of the principles to which the drug owes its slightly aromatic odour, bitterish and acrid taste.

The odour of the bark proved to be due to a volatile oil present in very minute quantity. By distilling 8 ounces of the ground drug with water a few yellowish green globules of the oil were separated. It possessed an aromatic, somewhat camphoraceous odour, and gave with litmus an acid reaction.

On continuing the distillation, with the addition of solution of potassa, no other volatile principles were observed.

The bitter taste resides in an amorphous, extract-like mass, soluble in ether, alcohol, and water, insoluble in petroleum benzin, and not precipitated by neutral or subacetate of lead. The process by which it was obtained is as follows:—The drug was exhausted with alcohol, this removed by distillation until the residue assumed the consistence of syrup; this residue was then precipitated in water, the resinous precipitate separated by filtering, and the filtrate evaporated to a soft extract, which was treated repeatedly with stronger ether. The ether solution on being allowed to evaporate spontaneously left a yellow mass, which, when dissolved in water and allowed to stand, separated crystals; the mother-water from the crystals, upon being evaporated, yielded the bitter mass already described.

It was also separated from an extract resulting from the evaporation of a decoction, by treating it with stronger ether, and proceeding with this ether solution as with the one above.

The crystals that were separated from the bitter principle possessed a taste which was at first saline, then developing a slight astringency; they were freely soluble in ether and alcohol, less so in water, and were entirely volatilized at a red heat.

The acrid principle is a resin, obtained in the form of a grey powder, possessing a strong and persistently acrid taste, insoluble in ether, soluble in alcohol. It is a resin remaining after treating with stronger ether the resinous precipitate yielded by the alcoholic extract in water.

The portion of this resinous precipitate which was soluble in ether consisted of a tasteless resin and much green colouring matter, undoubtedly chlorophyll.

In distilling for volatile oil, preparing decoctions, infusions, etc., much trouble was experienced through the formation of a dense and persistent froth. Steps were taken to separate this saponaceous principle, with the result of obtaining it in the form of a nearly white powder, inodorous, possessing a slightly acrid taste, freely soluble in water and dilute alcohol, almost insoluble in alcohol, and entirely insoluble in ether and chloroform. A process by which it was isolated is as follows:—The extract, procured by evaporating a cold infusion, was treated with stronger ether to remove the bitter principle, and the residue thoroughly washed with dilute alcohol; this solution was evaporated to an extract and dissolved in water. The aqueous solution yielded with a solution of lead acetate a scanty precipitate, which was separated by filtration. The filtrate gave with solution of subacetate of lead a copious precipitate, which was collected, well washed, the lead removed by suspending in water and passing hydrosulphuric acid through the solution, and the filtrate evaporated. The product of this evaporation proved to be this saponin-like substance; it was much improved in colour by dissolving in a small quantity of hot alcohol, from which it reprecipitated upon cooling, the alcohol holding much of the colouring matter in solution. This principle may also be obtained by exhausting the ground drug with boiling alcohol, from which it separates upon cooling. On boiling this body in a very dilute solution of hydrochloric acid, it proved to be a glucoside, yielding glucose and an insoluble white substance.

In the author's opinion, the name "araliin" should be applied to this principle. The araliin of Holden (*Amer. Journ. Pharm.*, August, 1880) is described as "a yellowish substance in scale, foaming excessively upon agitation" and is very probably this substance incorporated with some foreign matter.

The alkaloid announced by Elkin (*Amer. Journ. Pharm.*, August, 1880) as existing in aralia bark, could not be found. No precipitates were formed when Mayer's test, or a solution of iodine in iodide of potassium, was added to an acidulated infusion or decoction, nor to the solution resulting after treating an alcoholic extract with acidulated water.

No reactions were given indicating the presence of tannin. A green colour was produced by ferric chloride, but a solution of gelatin caused no precipitate with a somewhat concentrated decoction. Glucose was indicated by Trommer and Fehling's tests, as was starch by iodine. Milk of lime precipitated pectin from an acid decoction. Albumen was not coagulated upon boiling a cold infusion.

Guacamacha. (*Pharmaceut. Zeitung*, 1882, No. 45; *Amer. Journ. Pharm.*, 1882, 387.) Guacamacha is a South American tree, related to the oleander, emitting, in the rainy season, when wounded, a very active milk juice. The activity resides in an alkaloid, which is chiefly contained in the bark, and to a certain extent in the wood, and is soluble in water, little soluble in absolute alcohol, and insoluble in ether and chloroform. The aqueous extract is an effective preparation. Dr. Schiffer states that it will probably prove a suitable remedy in diseases with increased action of the motor apparatus, and as a hypnotic. In Frerichs' clinic, a young man suffering from spasms had 0.010 gram injected, and after the stage of incubation, lasting nearly three-quarters of an hour, in the daytime, slept soundly for three hours, and awoke without feeling the least disturbance; respiration and circulation were unaltered.

Microscopical Examination of the Bark of Rhamnus Purshiana. Dr. J. Moeller. (*Pharm. Centrallhalle*, 1882, No. 28.) The corky layer is about .045 mm. thick, and consists of 8 or 12 rows, somewhat flattened, rather thick-walled, but not sclerotic cells. The parenchyma of the primary bark is tangentially elongated, partly of a collenchymatic character, free from secondary cork, and contains groups of roundish stone cells, with very thick walls, and accompanied by single rhombohedric crystals; the thin-walled parenchyma contains numerous groups of crystals. The inner bark consists of medullary rays composed of two or three rows of thin-walled, somewhat radially elongated cells, and of broader bast rays, in which the parenchyma cells are coarsely dotted upon the radial and horizontal walls, and loosely united in a tangential direction; the sieve tubes are larger, irregularly angular, and united, to the

number of 4 or 6, by means of coarsely porous sieve plates, and on the radial sides marked with roundish sieve fields; the bast fibres form alternate groups of 2 or 3 rows, extending into few bast rays, and are surrounded by crystal cells. The medullary parenchyma contains a crummy lemon-yellow substance, which dissolves in water with a yellow, and in potash solution with a dingy red colour.

Sapotilla Bark. M. Bernou. (*L'Union Pharmaceutique*, xxiii. 291.) This West Indian drug is the produce of *Sapota achras*, and is said to possess tonic and febrifuge properties. The author has isolated from it a crystalline alkaloid which he proposes to name "sapotine." It is soluble in ether, chloroform, and alcohol, but insoluble in water. Besides this alkaloid, he has found the bark to contain two resins and a large proportion of "sapotannic acid," to the latter of which it owes its astringency.

Exostemma Caribæum. F. Stearns. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 216.) This member of the order *Rubiaceæ* is an odoriferous shrub indigenous to Mexico, the West Indies, and Guiana. The bark, known also as *Jesuit bark* and *sea-shore bark*, is smooth, reddish brown, and shows numerous minute crystals on its surface when viewed with a lens. The taste is first sweet, then bitter and astringent.

This drug possesses febrifuge properties, and has been recommended as a substitute for cinchona bark. Its medicinal properties are shared by *Exostemma cuspidatum* (Quino de Mato), *E. corymbiferum*, and *E. Phillipicum*.

Eucalyptus Rostratus as a Remedy for Diarrhœa. F. J. Hudson. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 220.) The author has tried this remedy in upwards of 200 cases, comprising the most varied forms of diarrhœa, and expresses himself very well satisfied with its action. The best preparations are stated to be the decoction (1 to 40), the concentrated decoction (1 to 20), and the syrup (1 in 3).

The tannin contained in it does not wholly account for its action, as the remedy proves efficient in cases in which tannin fails. For children he prefers the syrup in doses of 5 to 30 drops, to be given three or four times a day.

The Origin of Cassia Lignea. W. T. Thiselton. (*Journ. Linn. Soc.*, December 18th, 1882.) The author quotes from Mr. C. Ford's report to the Colonial Office respecting the cultivation and collection of this bark, and gives the results of Professor Oliver's examina-

tion of the specimens sent by Mr. Ford. These results fully confirm what hitherto was nothing more than a supposition, viz., that this bark is the produce of *Cinnamomum cassia*.

Researches on Tarchonanthus Camphoratus. F. Canzoneri and G. Spica. (*Gazz. Chim. Ital.*, 1882, 227-231, and *Journ. Chem. Soc.*, 1882, 1040.) This plant, belonging to the order Compositæ, sub-order *Asteroideæ*, is indigenous to the Cape of Good Hope. On exhausting its dried leaves with warm alcohol in a percolator, and leaving the alcohol to cool, a greenish white gelatinous substance is deposited, which may be purified by washing it on a filter with alcohol as long as the filtrate exhibits a green colour, then drying it in the air, twice crystallizing it from alcohol, washing the waxy substance thus obtained with ether, and finally crystallizing it from alcohol.

The substance thus purified crystallizes in white light scales, having a silvery lustre, melting at 82° , solidifying at a slightly lower temperature, and afterwards melting at 72° . It is tasteless, burns with a bright flame, leaving no residue, and emitting the characteristic odour of burnt wax. It is insoluble in water, slightly soluble in cold, freely soluble in hot alcohol; not attacked by strong sulphuric or hydrochloric acid or by strong potash-ley, and not sensibly altered by fusion with potash. Its analysis gave, as a mean result, 83·66 per cent. carbon and 14·44 hydrogen, and the chloride obtained by treating it with phosphorus pentachloride gave 80·77 per cent. C, 11·12 H, and 4·17 Cl. These results, together with the resistance of the substance to the action of melting potash, lead to the idea that it might be a higher homologue of myricyl alcohol, $C_{32}H_{66}O$, which is also unattacked by potash; if so, it must contain 50 or more atoms of carbon, and might be represented by either of the formulæ, $C_{50}H_{102}O$, $C_{51}H_{104}O$, $C_{52}H_{106}O$. The corresponding chloride melts at $67-68^{\circ}$; myricyl chloride at $64\cdot5^{\circ}$.

It is not yet decided whether this alcohol, which the authors propose to call *tarconyl alcohol*, exists in the leaves in the free state, or is produced by the action of the alcohol used in its preparation on a wax contained in the leaves. The solution from which the alcohol has been separated yields on evaporation a heavy, dark-coloured, pungent oil, consisting for the most part of an ether of an aromatic acid not yet examined.

Composition of Globularia. E. Heckel. (*Comptes Rendus*, xcv. 90-93. From *Journ. Chem. Soc.*) The leaves dried at 100° have the following composition:—

Soluble in Carbon Bisulphide—	
Fat and Wax	2·850
Soluble in Ether—	
Traces of Tannin and colouring matters, Globularin, and Cinnamic Acid	2·438
Soluble in Chloroform—	
Traces of Tannin and colouring matters, Globularin, and Cinnamic Acid	11·365
Soluble in Alcohol—	
Mannitol	1·815
Glucose	2·585
Globularin	4·550
Tannin	2·000
Colouring matter and Resin	17·000
Cinnamic Acid	1·750
Loss	0·850
Soluble in Water—	
Gum and Amylaceous bodies	0·850
Insoluble Resin	1·250
Ash.	2·105
Water	26·200
Woody fibre	13·092

The tannin is ordinary tannin, the globularitannic acid of Walz being a mixture of tannin and colouring matter. When boiled with dilute acids, globularin yields only one decomposition-product, *globularetin*, and not two, as stated by Walz. Globularetin, when freshly prepared, is oily or resinous, but after some time changes into a transparent amorphous mass. When dissolved in hot solutions of caustic alkalies, it combines with the elements of water, forming cinnamic acid. The leaves also contain another volatile aromatic substance, apparently benzyl cinnamate, but a quantity sufficient for examination was not obtained. The general composition of *globularia* is similar to that of trees which yield the balsams of Peru, Tolu, and storax.

Phyllanthus Nivuri. F. Stearns. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 217.) The leaves of this euphorbiaceous plant enjoy a great reputation among the native Indians as a diuretic, and is much used in dropsy, as well as in gonorrhœa and affections of the bladder. The root is bitter and astringent, and is successfully employed as a remedy for jaundice and similar complaints. The fruit of an allied species, *P. emblica*, was formerly used, under the name of *Myrobalana emblica*, in cases of diarrhœa and dysentery.

Gossypium Barbadosense. M. Anderson. (*Archiv der Pharm.*, October, 1882, 762.) The leaves of this plant are used in Jamaica

as a galactagogue, in the form of an infusion, of which a teaspoonful is administered four times a day. The infusion is usually taken with milk and sugar, to cover its unpleasant taste.

The Poisonous Principle of *Andromeda Japonica*. J. F. Eykman. (*Rec. Trav. Chim.*, i. 224-226; *Journ. Chem. Soc.*, 1883, 348.) By exhausting with water the fresh leaves of this plant, well known in Japan for its poisonous properties, agitating the concentrated and filtered solution with chloroform, and mixing the chloroform with light petroleum, a precipitate is obtained which may be dissolved in ether containing alcohol, and extracted therefrom by agitation with water; on evaporating the aqueous solution thus obtained, the poisonous principle remains in the form of a transparent, colourless, brittle, uncrystallizable substance, which the author has not been able to resolve into more definite constituents.

This substance, which the author designates as *asebotoxin*, is free from nitrogen, leaves no ash when burnt, and gave, as the mean of four analyses, 60.48 per cent. C, 7.40 H, and 32.11 O. It softens at 100°, and melts at 120°. It is more soluble in hot than in cold water, and dissolves readily in chloroform, common alcohol, and amyl alcohol; also in acetic acid and in ammonia, and to a smaller amount in caustic potash and soda, in all cases without decomposition.

It is but slightly soluble in pure ether, and nearly insoluble in benzene, light petroleum, and carbon bisulphide. The aqueous solution is neutral, and is not precipitated or changed in any way by ferric chloride, cupric sulphate, mercuric chloride, auric chloride, silver nitrate, or normal lead acetate, but gives a flocculent precipitate with the basic acetate. From an alkaline cupric solution it throws down a small quantity of cuprous hydroxide, but the precipitation is more abundant if the asebotoxin be previously heated with hydrochloric acid, and the filtered liquid added to the cuprous solution. Asebotoxin moistened with hydrochloric acid acquires a splendid blue colour, changing to red-violet at the heat of the water-bath. Strong sulphuric acid dissolves it with red colour, changing after a while to rose-pink, a bluish grey substance separating at the same time.

Asebotoxin exhibits the characters of a glucoside, and is extremely poisonous, a fatal dose for a rabbit by subcutaneous injection being 3 mg. per kilogram of bodily weight.

The poisonous principle of *Andromeda japonica* has been examined with similar results by P. C. Plugge, who calls it *Andromedotoxin*, and claims priority over the author.

Verbascum Thapsus. Dr. F. J. B. Quinlan. (*Brit. Med. Journ.*) The leaves of the *Mullein* are popularly used in Ireland, in consumption, and the plant, in addition to growing wild, is cultivated in gardens, occasionally on a rather extensive scale. The drug is administered by boiling an ounce of the dried leaves, or a corresponding quantity of the fresh ones, in a pint of milk for ten minutes, and giving the strained liquid warm, with or without a little sugar. From his observations, the author regards mullein as having a distinct weight-increasing power in early cases of pulmonary consumption. The hot decoction causes a comfortable sensation, and when patients take it they experience a physiological want for it. It eases phthisical cough, some patients scarcely requiring cough medicines at all. Its power of checking phthisical looseness is very marked, and it also gives great relief to the dyspnoea; but for phthisical night sweats it is utterly useless. In advanced cases it does not prevent loss of weight.

The decoction in milk is liked by the patient, in aqueous infusion it is disagreeable, and the expressed juice preserved by glycerin still more so.

Micromeria Douglasii. Dr. J. Moeller. (*Pharm. Centralhalle*, 1882, No. 29; *Amer. Journ. Pharm.*, 1882, 461.) This labiate plant of Northern California and Columbia, known as *yerba buena*, has been recommended as an anthelmintic, emmenagogue, and febrifuge. The drug is described by the author as consisting of quadrangular hairy stems. The leaves are opposite, ovate, short petiolate, obtuse, coarsely crenate, with the nerve branches running to the margin, and with sparse tertiary branches; the upper side almost smooth, the lower surface, densely, finely punctate, and on the nerves hairy; the largest leaves 4 cm. ($1\frac{3}{8}$ inch) long and 3 cm. ($1\frac{1}{8}$ inch) broad; the upper leaves smaller and more acute. The axillary pedicels are thin, about 7 mm. long; the calyx, mostly detached, is elliptic, 4 mm. long, 5 mm. broad; five-toothed, many-ribbed, hairy, internally naked, and contains at its base 4 nutlets. The drug has a slight aromatic odour, and an aromatic somewhat bitter taste.

The cuticle on both surfaces of the leaves is firm. The hairs are firm, conical, mostly two-celled, and rest, with a broad base, upon the somewhat parent cell. The glands are contained in concave depressions, are depressed, have a simple stipe cell, and contain a yellow secretion.

Khat, Cafta, or Arabian Tea. (*Produce Markets' Review*, March 24, 1883, from the *Indian Agriculturist*.) With the Arabs *Catha edulis* is a plant of some importance, inasmuch as it furnishes them

with one of the necessities of life in every country, namely, tea. The plant is of a shrubby nature, growing about ten feet high, with smooth, elliptical, serrate leaves, two or more inches long, and about an inch wide. They are peculiar in being arranged on some branches opposite to each other, and on others alternate. The flowers are small and white. The plant is largely cultivated in the interior of Arabia, mostly in gardens along with coffee. For the purposes of commerce, the twigs, with the leaves attached, are gathered and carefully dried; they are made up into closely pressed bundles of different sizes, the quality being known by the form and size of the bundles, the best of which are about a foot or fifteen inches long, and three inches wide; about forty slender twigs compose these bundles, which are tied together with strips of bark. The bundles are sent into Aden from the place of cultivation in the interior of Arabia, in very large quantities, and sell at an average price for good quality of about two annas per bundle. The use of this tea in Arabia is said to antedate that of coffee; the effects of its use are described as similar to those of strong Chinese green tea. In consequence of its stimulating effects khat was at one time classed by the people as an intoxicant; the use of intoxicating substances being forbidden by the Koran, this fell under condemnation. A synod of learned Mussulmans, however, made a decree that, as it neither injured the health nor hindered the proper observance of religious duties, but simply increased good humour and hilarity, it was perfectly lawful to use it. Besides the use of the leaves in the preparation of a beverage, the Arabs also chew them both in the green and dried state, the effect of which is to increase the flow of hilarity or mirth, and to produce extreme wakefulness and watchfulness, so that a man may fulfil the duties of sentry all night without a feeling of drowsiness, an effect somewhat similar to that produced by coca. This plant is considered by the Arabs as an antidote to the plague, and they also say that infection cannot be contracted if a twig is carried about on the person. About three hundred camel-loads are brought into Aden in the course of a year.

Jacaranda Procera. Dr. J. Moeller. (*Pharm. Centralhalle*, 1882, 342-344.) The dry leaves are of various shades of light green and brown, and variable in size and shape; but there are intermediate forms, agreeing in all other characters, which renders it probable that the drug is derived from one species only. They are asymmetric, particularly near the base, are somewhat leathery, slightly revolute, the upper surface glossy, apparently smooth, the lower surface on the veins and near the margin velvety hairy; the

petioles are occasionally short, and the secondary nerves anastomosing near the margin. The cuticle of the upper surface is thicker than upon the lower surface, the palisade layer is simple, the mesophyll rather dense. The epidermis consists of sinuate cells with numerous stomata on the lower surface, and upon both surfaces with two kinds of hairs, either one-celled, conical, obtuse-pointed, rough, thick-walled and about 0.5 millimeter long, or short-stiped, flat, formed of 6 or 8 stellately-arranged cells, and containing an amber-coloured secretion.

The drug is inodorous and has a bitter and astringent taste. It became first known in Germany in 1828, and about fifteen years ago was recommended as blood-purifying, diuretic, and antisyphilitic. Hesse (1880) found it to contain no alkaloid.

Arctostaphylos Glauca. Dr. J. Moeller. (*Pharm. Centralhalle*, 1882, 355.) The leaves are elliptic or ovate, 25 to 40 millimeters long, 15 to 25 millimeters broad, short petiolate, mucronate, leathery, the margin slightly thickened, smooth, pale green, one-nerved, the secondary nerves not prominent, and with marginal termination, both surfaces delicately and evenly netted-wrinkled, inodorous, astringent, and bitter. The author describes the vascular bundles as being of an interesting structure, not roundish, but linear on cross-section; the bast layers, however, not extending to the epidermis, but ending with a stratum of collenchyma tissue, which spreads under the epidermis and often extends to the collenchyma of the adjoining vascular bundle. The parenchyma contains iron-bluing tannin. J. H. Flint obtained arbutin from the leaves.

Constituents of the Leaves of Fraxinus Excelsior. W. Gintl and F. Reinitzer. (*Monatsh. Chem.*, iii. 745-762.) The authors found in the aqueous decoction of these leaves calcium malate and tannin, with smaller quantities of mannite and inosite, and still smaller quantities of quercitrin, dextrose, gum, and free malic acid. Fraxitannic acid is amorphous, yellow-brown, brittle, in powder golden yellow, deliquescent to a yellow-brown shining mass. It is insoluble in benzene, chloroform, and anhydrous ether, readily soluble in alcohol, acetic acid, ethyl acetate, and water, and precipitated from the latter solution, like other tannins, on saturation with common salt, but not by tartar emetic. Lead acetate gives a fine golden yellow precipitate easily soluble in acetic acid, becoming brown-green on exposure to the air, and at the same time less soluble in acetic acid. Ferric chloride causes a brownish green colour and precipitate, changing to blood-red on the addition of an alkaline hydrate, carbonate, or acid carbonate, the colours be-

coming dingy on exposure. Mercuric chloride causes a slight precipitate of calomel; warming it with alkaline cupric solution throws down cuprous oxide; heated with dilute acids or baryta water, no glucose is yielded. Dried in a vacuum at ordinary temperature, its composition is $C_{13}H_{16}O_7$, and after heating to $100^{\circ}C$. in a stream of carbonic anhydride, $C_{26}H_{30}O_{12}$, the anhydride being only slightly soluble in hot water.

A minute quantity of volatile oil was obtained, which had a strong and very pleasant odour like that of syringa flowers; it boiled at $175^{\circ}C$., and had the composition $C_{10}H_{20}O_2$.

Convallaria Majalis. A. Langlebert. (*L'Union Pharmaceutique*, xxiii. 338. From *Pharm. Journ.*) The action of this plant appears to be due to a glucoside and an alkaloid. Walz, in 1830, isolated from it two glucosides, "convallamarin" and "convallarin." In 1865, Stanislas Martin obtained an alkaloid, "maialine," an acid, "maialic acid," an essential oil, a yellow colouring matter, and wax. This plant, therefore, contains several principles that are themselves subject to modification. In fact, under the influence of dilute acids, convallamarin splits up into sugar and "convallamaretin," and convallarin into "convallaretin." The chemical composition being known, it was necessary to determine the seat of the active principles, it being easy to foresee that the effects would be different according to the parts of the plant employed. The experiments made hitherto have indicated that all the activity resides in convallamarin and maialine, convallarin appearing to be nearly inert.

Already for a long time the *Convallaria majalis* has attracted the attention of the scientific world. Cazin tried the flowers in the form of an electuary, and obtained abundant stools; the root produced emeto-cathartic effects. Schultze prepared an alcoholic extract of the flowers, which was bitter and purgative in doses of two grains.

Wouters, Peyrille, Cartheusen, and Klein, made it out to be a purgative analogous to scammony and aloes. The author wishes to emphasize this point, because one of the difficulties met with is the elimination, at least partially, of the purgative principle. The extract actually prepared is exempt from it.

In idiopathic epilepsy, headaches and convulsions, Senckenberg, father and son, employed it in doses of from 1 to 4 grams. Hitherto, it would appear, the action on the heart was not even suspected.

In 1880 some Russian physicians experimented with an infusion of the plant, but without sensible results.

Recently the *Convallaria majalis* has been tried by Professor Sée in his clinical practice at the Hôtel Dieu, physiological researches being made simultaneously in the laboratory by Messrs. Bochefontaine and Hardy. Alcoholates and tinctures of the entire plant and of the various parts were prepared, but the results upon the heart were not conclusive. Infusions, even in large doses (6 or 7 grams of the plant), were not uniformly successful. It became necessary, therefore, to prepare extracts of the entire plant and each of its parts, taking into account the action of the menstruum upon the active principles contained in the plant.

The aqueous, alcoholic, and hydroalcoholic extracts prepared from the roots did not give the results sought for. In the author's opinion, the emeto-cathartic action which was observed in a series of extracts prepared by him, was to be attributed to the presence of too large a proportion of the roots.

The aqueous, alcoholic, and hydroalcoholic extracts of the leaves are three times less active than the extract actually prepared. Moreover, the aqueous and alcoholic extracts of the root and leaves, whilst fulfilling the therapeutic indications, possessed emetic and purgative properties when given in large doses.

The extracts prepared from the flowers and stalks gave good results, especially with animals, in which the cardiac phenomena observed were very remarkable; they were unaccompanied by emetic or purgative effects, but with very slight diuresis.

From the foregoing facts it would appear that each part of the plant employed produces a slightly varied effect. After several trials made with the flowers, stalks, leaves and roots, the best results were obtained with an aqueous extract prepared from the flowers and stalks, with the addition of a third of their weight of roots and leaves.

This extract, deprived in great part of the resinous purgative principle, is solid in consistence, shining black, possesses a very bitter taste, is soluble in all proportions in water and alcohol, and has an agreeable persistent odour. It is used in the preparation of an aromatized syrup, having a pure bitterness without after-taste, and containing 50 centigrams of extract in each tablespoonful. It is in this form, and in doses of two, three, or four spoonfuls, that the medicament is prescribed in the treatment of cardiac affections.

Researches upon *Convallaria Majalis*. G. Sée. (*L'Union Pharmaceutique*, xxiii. 337. From *Pharm. Journ.*) The lily of the valley has been known from time immemorial among the Russian peasants as a certain remedy for dropsy. This popular belief

became in 1880 the subject of experiment by Messrs. Troitzky and Bojojawlensky, but insufficient was published to attract attention to the subject. The statements, however, being supported by Professor Botkin, of St. Petersburg, impressed the author, who took the first opportunity for their verification, it being necessary to procure the plant in flower to determine the active part.

The Russian physicians had spoken of infusions, without saying whether they were prepared from the flowers, stalks, roots, or entire plants. The various parts of the plant were therefore tried under the form of infusions, aqueous or alcoholic macerations, and lastly of extracts. The infusion of the flowers was without effect, even in doses equal to five or six grams of the flowers, whilst the tinctures and even the alcoholatures were infinitely less active than the extracts, which the author classes as follows, according to their order of merit:—(1) aqueous extracts of the leaves, which require a dose three times as large as the extracts from other parts of the plant; (2) extracts of the flowers, which exercise upon animals a very energetic action, and upon man a much less intense one; (3) extracts of the entire plant, including flowers, stalks, and roots.

Walz, in 1830, obtained from the aqueous extract of the dried flowers and roots the toxic principle called "convallamarin"; the alcoholic extract yields "convallarin," which is of little importance. The former principle is a glucoside, splitting up, under the influence of acids, into sugar and convallamaretin.

M. Hardy, demonstrator of chemistry in the laboratory of the Hôtel Dieu, has obtained convallamarin in the amorphous state. It was obtained from extracts of the plant, by Dragendorff's process; treating the acidulated aqueous extract with alcohol and then with chloroform or amylic alcohol. This principle has an activity comparable to that of pure digitaline, with which experiment shows it to have points of analogy as well as of difference.

In order to arrive at the therapeutic dose of the extracts to be given to man, preliminary trials were carefully made first upon animals. By an approximative calculation, based upon corporeal weight, the dose useful in cardiac disease was determined. It may be thus formulated:—1 gram to $1\frac{1}{2}$ or even 2 grams of extract of the flowers or of the entire plant; extract of the leaves is only active with double this dose.

The Active Principle of *Convallaria Majalis*. C. Tanret. (*Journal de Pharm.* [6], iii. 355; *Pharm. Journ.*, 3rd series, xiii. 423.) The active principle of the lily of the valley has been known for many years. Walz, in 1858, announced that the lily

of the valley contained two glucosides, which he named "convallarin" and "convallamarin." In 1867 Marmé made some physiological experiments with these two bodies, and published his researches under the title, "Ueber Convallamarin, ein neues Herzgift." With convallarin, in doses of 3 to 4 grains, he obtained only a purgative effect; but he found that convallamarin acted principally upon the heart, and in a very small dose when injected into the circulatory system: 7 to 10 milligrams for dogs weighing 7 to 14 kilograms; 3 to 8 milligrams for cats of 2 to 3 kilograms; 2 to 3 milligrams for rabbits of 1 to 1.2 kilograms, etc. He also determined the toxic doses to be a crural injection of 15 to 30 milligrams for dogs, 5 to 8 milligrams for rabbits, etc. Death followed usually a few minutes after the administration of these doses, happening by stoppage of the heart, and nearly always accompanied by very intense clonic convulsions. He adds that there is no doubt that convallamarin is a heart poison, and that its physiological action approaches qualitatively and quantitatively that of digitalin, helleborin, the upas principles, etc.

Whilst convallarin is soluble in alcohol, but insoluble in water, convallamarin dissolves in water in all proportions, and is very soluble in ordinary alcohol and methylic alcohol. Convallamarin is insoluble in ether, chloroform, and amylic alcohol, and is uncrystallizable. The author has observed that it rotates the plane of polarization of light strongly to the left, and has found its rotatory power in alcoholic solution to be $\alpha_D = -55^\circ$. Pure convallamarin does not reduce Fehling's solution until it has been boiled with dilute acid, when, according to Walz, it splits up into glucose and convallamaretin. Sulphuric acid dissolves it with a brown colour; but if it be treated with this reagent after having been moistened [? with water], a beautiful violet colour is developed, which disappears upon the addition of water. Its taste is bitter, followed by a peculiar after-taste.

As the solvents of this glucoside are the same as those of the accompanying reduced sugar, it appeared impossible to obtain pure convallamarin—not reducing cupric solution—by the action alone of neutral liquids employed successively upon the plant or its extract. The process of Walz gives a satisfactory product, but as this is long and inconvenient, the author has modified it in the following manner.

An alcoholic tincture made from the whole plant is precipitated with subacetate of lead, and filtered, excess of lead is removed with dilute sulphuric acid, avoiding the use of more than is necessary,

and after neutralizing, the tincture is distilled, the last portion of the alcohol being driven off in the open air; then the cooled and filtered liquor is treated with tannin, care being taken to keep the liquid neutral by sparing additions of a dilute solution of carbonate of soda. A compound of tannin and convallamarin is precipitated, which, after washing, is dissolved in 60° alcohol, the solution decolorized with charcoal, decomposed with zinc oxide, filtered, and evaporated to dryness. In this way convallamarin is obtained nearly white, and having the appearance of ordinary digitalin. To free it from salts that are sometimes carried down by the tannin precipitate, it is a good plan to redissolve it in 90° alcohol, filter, and then evaporate.

This treatment, applied to the lily of the valley collected in the first days of August, produced a yield of two grams of convallamarin per kilogram of the fresh plant.

With this process the preparation of convallamarin does not present any serious difficulties; and if the lily of the valley should remain in the medical armamentarium, its active principle should be substituted for the plant by those who wish to protect themselves from the inconveniences presented by so unequal a distribution of convallamarin in the various plants, its variability according to the time of collection, and its alteration in the extracts.

In order to verify this latter point, the author made the following experiment, based upon the loss of rotatory power which solutions of convallamarin undergo when the glucoside decomposes.

A pound of lily of the valley being taken, of which its strength in convallamarin was known, its acidity was estimated and calculated as oxalic acid. Corresponding quantities of convallamarin and acid were then dissolved in 100 grams of water. This solution was evaporated in a water-bath to the consistence of an extract, then redissolved in water, and examined polarimetrically. The rotatory power had diminished one-half; one-half, therefore, of the active principle had been decomposed and was no longer present as such in the extract, which, however, had been prepared under the most favourable conditions, the quantity of liquid to evaporate having been very small.

Convallaria Majalis. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xiii. 1058.) This is an interesting summary of the literature of this plant from a medical, chemical, and pharmaceutical point of view. It terminates with the conclusion that our present knowledge is insufficient to decide the question whether or not digitalis is likely to be superseded by *Convallaria majalis*, and that nothing but a

lengthy and systematic trial can settle this point. For details of the summary reference must be made to the original article.

Delphinium Ajacis. Dr. Benvenuti. (*Amer. Journ. Pharm.*, 1883, 50.) From his experiments with the acetic and aqueous infusion, the author draws the following conclusions: The flowers of the *Delphinium* possess an insecticide action. They are to be preferred to other remedies of similar action on account of cheapness and absence of smell. They have a marked anæsthetic action, are excitant, rubefacient, astringent, and antizymotic. The author thinks this remedy has many points of resemblance to carbolic acid and iodoform.

Delphinium Consolida. E. Masing. (*Pharm. Zeitschr. für Russland*, 1883, 3.) The author obtained from 5 kilos. of the dried flowering herb about 1 gram of alkaloid, for which he proposes the name *calcatripine*, derived from *flores calcatripæ*, under which name the flowers were formerly officinal. The alkaloid, dissolved in one thousand parts of acidulated water, gave precipitates with the various group reagents for alkaloids; tannin yielded a faint turbidity after twenty-four hours; mercuric chloride, ammonium molybdate, and potassium bichromate had no effect. Sulphuric acid, sp. gr. 1.84, gave a red-brown colour, changing to violet brown, and after twenty-four hours to grey-brown. Fröhde's reagent coloured olive-green, becoming gradually deeper, then fading to grey-yellow. Sugar and sulphuric acid gave a red-brown colour, slowly changing to greenish blue. Sulphuric acid, followed by nitric acid or a nitrate, causes the red-brown colour to change to orange-red, then orange-yellow, and finally golden yellow. The alkaloid, which was not quite pure, is soluble in alcohol, ether, and chloroform, and appears to be easily decomposed by chemical agents.

Microscopic Examination of Myrtus Cheken. J. Hoehn. (*Therapeut. Gaz.*, 1882, 284.) The upper side of the leaf is depressed at the midrib, and the underside elevated. The epidermis is composed of thick-walled empty cells and a thick cuticle. Next come two rows of palisade cells, filled with starch and chlorophyll. Between the palisade cells and lower epidermis are thick-walled parenchyma. Among this there are oil and resin cells and intercellular spaces. The resin cells seem to have a cellular structure. The midrib is composed of three zones, the upper and lower zones made up of bast fibre, and the middle one of wood prosenchyma. The only difference between the cross and longitudinal is the elongation of cells in the longitudinal section.

Myrtus Cheken. J. W. England. (*Amer. Journ. Pharm.*, 1883, 247.) The author has determined the constituents both of the stem and leaves of this plant, and obtained the following results:—

Stems.

- | | |
|----------------------------|---|
| 1. Moisture . . . | 10 per cent. |
| 2. Ash . . . | 4·84 per cent. chlorides, phosphates, sulphates and carbonates of potassium, magnesium, calcium, and aluminium; silica. |
| 3. Volatile principles . | |
| 4. Benzin extract . | 5·45 per cent. yellow colouring matter, fixed oil, fatty acid. |
| 5. Alcoholic extract. | 6·25 per cent. resin, tannin, extractive. |
| 6. Hydro-alcoholic extract | 5·2 per cent. tannin, organic acid, extractive. |
| 7. Aqueous extract . | 4·08 per cent. gum, colouring matter. |

Leaves.

- | | |
|----------------------------|--|
| 1. Moisture . . . | 10 per cent. |
| 2. Ash . . . | 8·4 per cent. chlorides, phosphates, sulphates and carbonates of potassium, magnesium, calcium, and aluminium; silica. |
| 3. Volatile principles . | Volatile oil, volatile alkaloid. |
| 4. Benzin extract . | 5·3 per cent. yellow colouring matter, volatile oil, chlorophyll, fat, wax. |
| 5. Alcoholic extract. | 10·2 per cent. resin, tannin, extractive. |
| 6. Hydro-alcoholic extract | 6·25 per cent. tannin (4 per cent.), organic acid, colouring matter, extractive. |
| 7. Aqueous extract . | 4·5 per cent. gum, starch, colouring matter, extractive. |

Pharmaceutical Preparations.—The active principles of cheken, as seen above, reside wholly in the leaves, and are a volatile alkaloid, in combination with an organic acid, volatile oil, tannin, fixed oil, resin, and minor proximate bodies. It is obvious that the best preparations of the leaves are those containing all the active ingredients. By various experiments, alcohol diluted with one-third of water was found to be the best solvent, and maceration followed by percolation the best for extraction. A fluid extract submitted

was prepared according to the general process of the United States Pharmacopœia (1870) with a menstruum composed of 3 parts alcohol, 1 part of water; its dose is one to three fluid drachms. A 20 per cent. tincture may be made with the same menstruum, and a convenient strength of the infusion is 10 per cent.

Therapeutic Properties.—Cheken has lately been brought quite prominently into notice by the writings of Dr. Henry von Dessauer, of Valparaiso, and Dr. W. Murrell and Mr. E. M. Holmes, of London, in the treatment of bronchitis, laryngitis, diphtheria, hæmoptysis, etc. Tonic, diuretic, expectorant, and antiseptic properties are claimed for it.

The “Tambor,” a Tree yielding a Purgative Oil, with Descriptions of Two Species of *Omphalea*. W. B. Hemsley. (*Pharm. Journ.*, 3rd series, xiii. 301.) Some twenty years ago, Dr. Dorat, of Sonsonate, San Salvador, Central America, sent to the late Daniel Hanbury dried specimens of a tree called “tambor,” that was said to yield a valuable purgative oil, resembling castor oil in its properties, with the advantage of having a more agreeable flavour. Mr. Hanbury sent one specimen to Kew Herbarium, where it was recognised as a species of *Omphalea*, near, if not identical with specimens collected by Sutton Hayes, at Acajutla, not far from Sonsonate, but apparently different from any described species. Nothing further seems to have been done with the plant. The genus *Omphalea* comprises about eight known species, one of which is endemic in Madagascar, whilst all the others are restricted to tropical America. This peculiarity in distribution is shared by some other genera of plants, *Ravenala* for example; and it also finds a parallel in the animal kingdom, according to Wallace. The most striking distinctive character of the genus is in the male flowers, or rather in the stamens, of which there are two or three in each flower. They are united, and form together a body shaped like a mushroom. The columnar portion is short, and the cap consists of the thickened dilated connectives of the two or three stamens, so that the two cells of each anther are distant from each other. In the author’s specimen of *O. cardiophylla*, the number of stamens is usually two, but there were three in one flower. All the flowers examined, both male and female, had a calyx of four decussate sepals, yet it is likely that in these species, as in the others, the number may vary from four to five.

Concerning the “tambor,” Dr. Dorat sent the following note to Mr. D. Hanbury:—“The fruit, about the size of a pear, contains three beans, jet black, which, by pressure, yield a very fine oil in

large quantity, rather pleasant to the taste, and resembling castor oil in its purgative effect, with the advantage that it does not gripe. The leaf is large and is used here for packing cheese, on account of its strength. Flowers in December; fruit ripe in February or March. The seeds are covered with an exceedingly hard, black, thin epidermis, with a white soft pulp containing the oil, which besides its purgative quality burns well. Seeds (seed-vessels) grow in large bunches."

For this species the author proposes the name *Omphalea oleifera*, and the following is a description as far as the material will permit:

OMPHALEA OLEIFERA, Hemsley, species nova. *O. foliis amplis fere orbicularibus profunde cordatis stellato puberulis paniculis brevibus ramosis, bracteis paucis infra pollicaribus, ovario glabro.*

Arbor? ramulis ultimis inflorescentias gerentibus crassocarnosis. Folia (unicum circiter 5 poll. diametro a nobis tantum visum) petiolata, tenuia, papyracea, sparse stellatopuberula (pilis deciduis), suborbicularia, profunde cordata ("ampla, lenta" Doratius), venis primariis lateralibus utrinque 5 vel 6 conspicuis; petiolus in spec. Kewens. omnino deest. Flores monoici, paniculati; paniculae terminales, late, ramosae, puberulae; bractea paucæ, petiolatæ, angustæ, oblongæ, viæ 1 poll. longæ, venosæ, puberulae; calycis sepala in fl. ♂ ut in fl. ♀ 4, decussata, orbicularia, ciliolata; antheræ 2; ovarium glabrum. "Fructus magnitudine pyri, 3-spermus; semina nigra, oleam gratam purgativam copiose præbentia."—Dorat.

This and the following differ from all the previously described species in having thin, strong, papery leaves, and perhaps also in their very stout ultimate branchlets. This differs, too, from the common *Opmhalea diandra* in having a glabrous, not hairy, ovary; and it differs from *O. cardiophylla* in its leaves being sparsely furnished with stellate hairs, in its short branching, narrow panicles, and in its smaller bracts.

Here is a description of Sutton Hayes's plant numbered 617:—

OMPHALEA CARDIOPHYLLA, Hemsley, species nova, *O. foliis amplis fere orbicularibus profunde cordatis glaberrimis, paniculis angustis elongatis, bracteis oblanceolatis ad 2 poll. longis.*

Arbor 30-40 pedalis (fide Hagesii), ramulis . . . Folia (2 tantum visa) longe petiolata, tenuia, papyracea (in vivis subcarnosa?), glaberrima, suborbicularia, basi profunde cordata, apice acuminata, obtusa (majus fere pedem diametro), undulata; venis primariis lateralibus utrinque 5 vel 6, conspicuis; petiolus (perfectus deest) saltem 4 poll. longus, apice 2-glandulosus, crassus, carnosus, in siccis infra medium crassior. Flores (♂ tantum visi) paniculati; paniculae

angustæ, graciles, terminales (pendulæ ?), pedem vel ultra longæ, obsolete puberulæ; bracteæ oblanceolatae ad 2 poll. longæ, venosæ, graciliter petiolatæ, petiolo 2-4 lineas longo, apice 2-glanduloso; calycis sepala 4, decussata, orbicularia, ciliolata; antheræ 2 vel interdum 3.

Cannabis Indica. Dr. M. Hay. (*Pharm. Journ.*, 3rd series, xiii. 998.) A preliminary notice announcing the isolation from *Cannabis indica* of a crystallizable alkaloid possessing characters analogous to those of strychnine. This base the author proposes to name *tetano-cannabine*. Indications were also obtained of the presence of several distinct alkaloids in this drug. The author promises a further communication on this subject.

Koromiko (*Veronica salicifolia* and *V. parviflora*.) Dr. J. Jardine. (*Pharm. Journ.*, 3rd series, xiii. 85.) This drug is highly esteemed in China, as well as New Zealand, as a remedy for dysentery and diarrhoea. The author has tried it in chronic forms of the disease, and reports most favourably on its efficacy.

Trifolium Pratense. M. Grazer. (*Pharm. Journ.*, 3rd series, xiii. 878.) A fluid extract of the flowerheads of red clover having been introduced in the United States as a remedy for whooping cough and scrofula, and an infusion as a wash for ill-conditioned ulcers, the author submitted the flowerheads to analysis. He found them to contain two resins and a peculiar acid principle, but does not appear to think that there is any constituent present to which a special therapeutic action could be attributed.

A New Adulterant of Saffron. Dr. J. Biel. (From *Pharm. Zeitschr. für Russland*.) The adulterant reported upon by the author consists of marigold florets (*Calendula officinalis*) coloured with dinitrocresylate of sodium, then impregnated with oil, and rolled up. In this condition it was found mixed with true saffron. The adulteration may be detected by means of petroleum spirit, to which the fictitious article imparts a lemon-yellow colour, while pure saffron leaves it uncoloured.

Adulterated Insect Powder. W. L. Howie. (*Pharm. Journ.*, 3rd series, xiii. 939.) The author confirms Conroy's statement that commercial insect powder is often grossly adulterated, but has not been able to satisfy himself that fustic is used as colouring agent in this powder, while chrome yellow and turmeric were found by him in a number of samples. Full directions are given in his paper for detecting these adulterants. He also endeavoured to devise a pro-

cess for the detection of fustic, based on the difference in the action of zinc and sulphuric acid on this colouring matter and on genuine insect powder, but the reaction failed to indicate less than 20 per cent. of the adulterant.

Guadeloupe Vanilla. Prof. Charbonnier. (*Chem. and Drugg.*, 1882, 83, from *Répert. de Pharm.*) The author directs attention to a new species of vanilla in the French market, as yet little known, and not described in any work on materia medica. It appears to have been cultivated in Guadeloupe during the past seven or eight years, and is probably furnished by a variety of *Vanilla planifolia*. This Guadeloupe Vanilla at first sight resembles that of Bombay or Java, but, though blackish, the colour of the pods is not quite so dark as the latter sorts. It is dryer looking, and not so covered with crystals of vanillin. But the special characteristics are a peculiar odour and the fact that the pods are somewhat flattened instead of being of the usual irregularly triangular form. The last-named characteristic is probably due to a difference in the method of preparation. Further, the surface of the pods is finely striated longitudinally, and there are but few depressions. Generally, this vanilla has a good appearance, but its perfume is coarser and less permanent than the Bourbon sorts. It is of inferior quality, but at the same time its price is only about half that of Bourbon vanilla.

Mango Fruit (*Mangifera Indica*). Dr. Linguist. (*Practitioner*, 1882, 220.) The unripe fruit of the mango is being tried in the United States in medicine. The author, who has introduced it, states that it is an astringent with a special tonic action on the mucous membrane, and that in the treatment of hæmorrhage and mucopurulent discharges he knows of no equal to it.

Therapeutic Properties of the Burdock (*Arctium Lappa*). Dr. Reiter. (*Pharm. Journ.*, 3rd series, xiii. 343.) The author has had personal experience concerning the value of the seeds of the common burdock in the relief of psoriasis inveterata. The preparations used were made by steeping the seeds in whisky or dilute alcohol. The author recommends for the former to place one pound of well-crushed fresh burdock seeds in a bottle with one gallon of good old whisky, and keep in a warm place, occasionally shaking it, for a fortnight. The maximum dose of the clear tincture is 4 fluid drachms, well diluted, three times a day immediately after meals; when the dose is a large one whisky is recommended as a menstruum, but for smaller doses proof spirit is

preferred. The author considers the therapeutic action of the tincture to be that of an alterative stomachic, and says it appears to improve all the nutritive, secretive, and assimilative functions. This use of burdock is by no means new, the root having long been used by herbalists as a common remedy for skin diseases.

Assay of Nux Vomica. W. R. Dunstan and F. W. Short. (*Pharm. Journ.*, 3rd series, xiii. 665. From *Journ. Chem. Soc.*) This subject being of great importance on account of the strychnine and brucine in nux vomica, the authors have investigated the matter in order to find an accurate and simple method, Dragendorff's method being too long and intricate. Experiments were tried in which the nux vomica was made into a paste with various alkaline solutions, dried, and the dried mass extracted with chloroform; in all cases the marc (the mass after extraction) was bitter, showing that the alkaloids were not wholly extracted, and therefore that chloroform alone is not an efficient medium for the purpose; a mixture of alcohol and chloroform (1 : 3), however, completely extracts the alkaloids from nux vomica. Experiment showed that it was not necessary to mix the nux vomica with alkali, but that the powdered seeds could be at once extracted with chloroform containing alcohol, as follows:—5 grams of the finely powdered nux vomica seeds are extracted for about two hours in an extraction apparatus, with 40 c.c. of chloroform, containing 25 per cent. of alcohol; this takes from one to two hours. The extract is well agitated with 25 c.c. of 10 per cent. dilute sulphuric acid, the chloroform separated, and again agitated with 15 c.c. of acid. The mixed acid solutions should be quite free from chloroform, filtered if necessary, then made alkaline with ammonia, and shaken with 25 c.c. of chloroform. The chloroform extract is run off, evaporated on a water-bath, and the residue, consisting of the alkaloids, weighed. It is sometimes necessary to filter the chloroform after separation from the alkaline liquid. By this process samples of commercial nux vomica were found to contain the following percentages of alkaloids:—2.92, 3.57, 3.32, 3.38, and 2.56.

The authors have successfully employed the mixture of chloroform and alcohol for the extraction of other alkaloids.

The Analysis of some Authentic Specimens of Nux Vomica. W. R. Dunstan and F. W. Short. (*Pharm. Journ.*, 3rd series, xiii. 1053.) The following method was adopted for the analysis of the seeds: 5 grams of the finely divided seeds, after drying at 100° C., were exhausted with 40 c.c. of chloroform containing 25

per cent. by volume of alcohol. For this exhaustion the extraction apparatus described by the authors in a former paper (*Pharm. Journ.* 3rd series, xiii. 663) was employed, and the hot digestion and repercolation continued, until a few drops of the solvent, after passing through the marc, left no residue on evaporation. The percolate was agitated with 25 c.c. of a 5 per cent. solution of sulphuric acid, the chloroform separated and agitated again with 10 c.c. of the dilute acid. The mixed acid solutions were filtered if necessary, rendered alkaline with ammonium hydrate, and shaken with two successive 15 c.c. of chloroform, or with a sufficient quantity to thoroughly extract the alkaloid. The chloroform was separated, if necessary filtered, evaporated, and dried at 100° C., until constant in weight, which usually occupied one hour. Some little trouble is always experienced in the separation of chloroform from aqueous liquids, especially when alkaline; the separation is much facilitated by heat, but even then, often much depends upon the ingenuity and dexterity of the experimenter. If, in the filtration of aqueous liquids containing chloroform the filter paper is well wetted with chloroform, the chloroform alone will pass through from the mixture, leaving the aqueous liquid; but if on the other hand, the paper be wetted with water, the aqueous liquid will flow through, leaving the chloroform upon the filter.

The appended tables show the results of two series of specimens of *nux vomica*. It will be observed that although the specimens in the two series differ in alkaloidal content, the order of content in each series is precisely the same; that is, Bombay first, Cochin second, and Madras third. These results are at once interesting and important. The specimen of "Bombay" in the second series contains the largest percentage of alkaloid yet recorded in the seeds of *Strychnos Nux-vomica* (3.90). Of the specimens (? source) examined by Dragendorff, the highest percentage of total alkaloid found was 2.88. In the series of commercially powdered *nux vomica* previously analysed by the authors (preceding abstract), the richest specimen yielded 3.57 per cent. The present results also show that these above-mentioned specimens of powdered *nux vomica* were of good quality and free from adulteration.

SERIES I. (collected 1877).

Specimen.	Diameter.	Thickness.	Circumference.	Nature of Edge.	Texture.	Form.	Interior.	Percentage of Strychnine and Brucine.
BOMBAY Fine	20.25 to 25.5 mm. average 23.0.	4.0 mm.	60.0 to 82.5 mm. average 70.0.	Generally acute.	Very silky.	Nearly flat; fairly regular; few concavo-convex and bent.	Cotyledons 7-veined; two outer veins small.	3.46
BOMBAY Ordinary	19.0 to 29.0 mm. average 23.0.	5.0 mm.	60.0 to 82.5 mm. average 70.0.	Generally rounded; some acute.	Silky.	Nearly flat; some irregular; few concavo-convex.	Cotyledons 7-veined; two outer veins small.	3.14
COCHIN	19.0 to 28.0 mm. average 23.0.	4.0 to 6.0 mm. average 5.0.	57.0 to 79.0 mm. average 68.0.	Round; few acute.	Silky.	Nearly flat; some concavo-convex; many irregular.	Cotyledons 7-veined; two outer veins small.	3.04
MADRAS	12.5 to 23.0 mm. average 18.0.	4.0 to 5.0 mm. average 4.5.	38.0 to 71.0 mm. average 57.0.	Generally round; seldom acute.	Dull.	Nearly flat; some slightly concavo-convex; some irregular.	Cotyledons 7-veined; two outer veins small; albumen resinous.	2.71

23
35

SERIES II. (collected 1883).

Specimen.	Diameter.	Thickness.	Circumference.	Nature of Edge.	Texture.	Form.	Interior.	Percentage of Strychnine and Brucine.
BOMBAY	20.0 to 28.0 mm. average 23.0.	2.25 to 4.0 mm. average 3.5.	59.0 to 84.0 mm. average 73.0.	Nearly all acute.	Very silky.	Nearly flat; fairly regular; some concavo-convex.	Cotyledons 7-veined; two lateral veins small and sometimes indistinct.	3.40
COCHIN	19.0 to 28.0 mm. average 25.0.	4.0 to 5.0 mm. average 4.5.	57.0 to 84.0 mm. average 74.0.	Round.	Slightly silky.	Nearly flat; few slightly concavo-convex.	Cotyledons 7-veined; two lateral veins indistinct.	3.60
MADRAS	12.5 to 21.5 mm. average 19.0.	4.0 to 5.0 mm. average 4.75.	38.0 to 65.0 mm. average 57.0.	Round.	Dull.	Nearly flat; some slightly concavo-convex.	Cotyledons 7-veined; two lateral veins indistinct; albumen resinous.	3.15

Constituents of Tamarinds. C. Mueller. (*Pharm. Centralhalle*, 1882, Nos. 49 and 50.) The author has examined 9 samples of East Indian tamarinds, with the following results:—

Seeds.	Pulp free from Seeds.					Dry Pulp.	
	Water.	Insolu- ble.	Potass. Bitart.	Tartaric Acid.	Citric Acid.	Potass. Bitart.	Tartari Acid.
Highest %, 38.0 .	30.81	20.2	6.01	8.80	3.95	8.25	12.25
Lowest %, 1.5 .	21.92	12.2	4.66	5.29	0.64	6.21	6.77
Average %, 13.9 .	27.00	16.2	5.27	6.63	2.20	7.20	9.09

The author found very small quantities of malic acid, which were calculated as citric acid. In his opinion, tamarinds should not contain more seeds than 10 per cent. of their weight; four of the samples contained considerably less (1.5, 2.4, 4.5, 6.0), two approached this limit (8.7, 9.8), and three exceeded it considerably (20.6, 23.3, 38.0.)

The Active Principle of Colocynth. G. Henke. (*Archiv der Pharm.*, ccxxi. 200–205.) The author reviews the various methods adopted by earlier chemists, Meissner, Braconnot, Vauquelin, Lebourdais, Herberger, Bastick, Hübschmann, and Walz, for the preparation of colocynthin, or the various impure products which have received this name, and subsequently describes the process followed by him, and the true characters of the colocynthin obtained.

Five kilograms of commercial colocynth, deprived of the seeds, were reduced to coarse powder, and extracted four times with alcohol diluted with an equal weight of water, with the aid of heat. The filtrates were united, the alcohol distilled off, and the residue extracted with water and filtered. To the clear, bright yellow filtrate a concentrated aqueous solution of tannic acid was added, and the very abundant white precipitate thus formed allowed to deposit. As this required some time, its deposition was accelerated by the addition of powdered pumice-stone, the precipitate filtered out, well-washed, mixed with freshly precipitated carbonate of lead, and dried on a water-bath. Upon treating with boiling absolute alcohol, the colocynthin became immediately dissolved, and, after evaporation and drying over sulphuric acid, it remained as a resin-like mass. When triturated, it formed a permanent, loose, and bright yellow powder.

Colocynthin is without action upon litmus, and is soluble in 20

parts of cold or 16 parts of warm water; it is likewise very readily soluble in alcohol, but more difficultly in absolute alcohol. If to the alcoholic solution an excess of ether be added, the colocynthin separates out in the form of white flakes. It is insoluble in chloroform, ether, benzol, carbon bisulphide, and petroleum ether. When heated on platinum-foil it burns without leaving a residue. Besides being soluble in water and in alcohol, it is also very readily dissolved by ammonia-water and an aqueous solution of chromic acid. Concentrated sulphuric acid dissolves it in the cold, forming a deep red liquid, and, upon warming, the colocynthin is immediately destroyed; dilute sulphuric acid is without any action. Concentrated nitric acid dissolves it in the cold with a bright red colour, becoming somewhat darker on warming; dilute nitric acid shows the same behaviour, but is much slower in its action. With concentrated hydrochloric acid it forms, even in the cold, a bright yellow liquid, which upon boiling becomes decomposed with the separation of a sticky, dark grey substance; dilute hydrochloric acid dissolves it only by the aid of heat. It is slowly dissolved by fresh chlorine water, as also by solutions of potassium or sodium hydrate, especially on boiling. The aqueous solution of colocynthin is completely precipitated by tannic acid, with the formation of a very abundant white flocculent precipitate; acetate of lead produces only a very slight white turbidity. The solution in water is not effected by basic acetate of lead, ferric chloride, silver nitrate, lime-water, ferrous sulphate, potassium ferrocyanide, mercuric chloride, ammonia, and the alkalies.

When heated with caustic alkali it develops no ammonia. The aqueous solution of colocynthin quickly reduces Fehling's solution; if to the aqueous solution a few drops of sulphuric acid be added, a slight turbidity ensues.

Although Walz is stated to have obtained colocynthin in a crystalline form, the experiments of the author upon the colocynthin of his own preparation, as also with that of Walz, Bastick, and Hübschmann, afforded only negative results; it always remained as a sticky mass, becoming brittle upon complete drying. The author furthermore considers the statement of the decomposition of colocynthin into sugar and colocynthein by the action of concentrated sulphuric or hydrochloric acid to be very improbable.

The entire yield of pure colocynthin from 5 kilograms of colocynth amounted to scarcely 30 grams. Walz claims to have obtained a yield of 2 per cent.; but this statement is incompatible with the author's results.

Poisonous Constituents of Thevetia Nereifolia. C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xiii. 42.) Some time ago it was pointed out that thevetin, the glucoside isolated by Dr. de Vrij from the kernels and bark of *Thevetia nereifolia*, possessed toxic properties. The author now shows that the kernels contain a second poisonous principle, apparently of greater activity than thevetin.

This second principle was obtained by precipitating the mother-liquor left after the crystallization of thevetin by tannic acid, and decomposing the precipitate by lime. By the action of absolute alcohol a yellow extractive was obtained, which had the following properties: it was persistently bitter, non-crystalline, and readily soluble in water. On aqueous solutions reagents produced the following effects: concentrated nitric or sulphuric acid, a yellow coloration; concentrated hydrochloric acid, no change in the cold or on heating; bichromate of potash and sulphuric acid, ferric chloride, or chlorine water and ammonia, no colour reactions; tannic acid, a white precipitate. 0.17 of a gram injected into a cat's stomach caused in five minutes convulsive movements of the hind legs, which lasted for some time; there was also vomiting and profuse salivation.

The amount of this principle isolated was only 0.067 of a gram, so that it was only possible to make a very cursory examination of its physical and chemical properties. It appears to differ from thevetin in a marked manner. Pure thevetin is white and crystalline, and only faintly bitter, and its aqueous solution is not precipitated by tannic acid.

A further communication on this subject is promised.

Nigella Sativa. Dr. Pellacani. (*Archiv für exp. Path. und Pharm.*, xvi. 441.) The author reports the isolation from the seeds of this plant of two alkaloids, nigelline and connigelline, which resemble the active principles of jaborandi in their physiological action. To the presence of these two alkaloids the therapeutic effects of the seeds, as observed by Dr. Canolle, are to be attributed.

Adulteration of Powdered Pepper. Prof. Charbonnier. (*Répert. de Pharm.*, 1883, 19-21.) The author directs attention to an adulterant, which is not a new one, but at present appears to be very extensively employed in France, particularly for white pepper. This is the putamen of olives, known in commerce as *grignons d'olive* (olive pits), or as *poivrette* (little pepper), a name probably given to it to create the impression that it contained some of the properties of pepper. These olive pits were formerly burned up and

used as manure (*engrais*); now it is found more advantageous to sell them at 25 or 30 francs for 100 kilos., and to use them for the adulteration of pepper. According to the treatment to which they are subjected, a grey or white powder is obtained, adapted for the adulteration of powdered black or white pepper. The hard shell consists of elongated stone cells, resembling those found in the epicarp of black pepper; but since white pepper is deprived of the pericarp, the adulteration of its powder with ground olive pits is readily detected, under the microscope, by the large number of stone cells.

The same adulteration may be detected, according to Dupré, by dusting the powder upon a liquid composed of equal parts of glycerin and water, upon which the powdered pepper will float, while the powdered olive pits will sink.

Determination of Myronic Acid and Mustard Oil in the Seeds of Cruciferæ. V. Direks. (*Biedermann's Central-Blatt. für Agrikultur-Chemie*, xii., Part 4.) The author deduces the proportion of these substances from the amount of sulphur found, and the latter he estimates in the following manner. He introduces the ground seeds into a retort, adds water, and connects the retort with a condenser and with one or two Will's absorption apparatus charged with a solution of 50 grams of potassium permanganate and 120 grams sodium hydrate per litre. After the retort has stood for some time at a moderate temperature in the water-bath, it is heated, and a current of air and one of hot steam are passed simultaneously through the apparatus. The liquid in the receivers is finally heated for some time, concentrated, mixed with strong hydrochloric acid, and evaporated to dryness; the residue is taken up with water and a few drops of hydrochloric acid, filtered, and, lastly, the sulphuric acid which has been formed is determined by precipitation with barium chloride. As the barium sulphate is contaminated with manganese, it is fused with soda and saltpetre, the solution of the green mass evaporated to dryness, the manganese separated by means of sodium acetate and bromine water, weighed, and deducted from the barium sulphate.

Pistia Stratiotes (Tropical Duckweed). C. J. H. Warden. (*Chemical News*, xlvii. 133.) This tropical water-weed, occurring on pools of stagnant water in most parts of India, has much the appearance of half-grown lettuce plants, to which it owes its West Indian name of "water lettuce." In some parts of India the mature plant is dried, incinerated, and lixiviated, and under the name of "páná salt," the saline product is used for medicinal pur-

poses as a domestic remedy. According to Colonel Drury ("Useful Plants of India," p. 34) the plant is cooling and demulcent, and is given in dysuria, whilst poultices of the leaves are applied to hæmorrhoids. In Jamaica, in the hot dry weather, the *Pistia stratiotes* is said to impregnate the water in which it grows with its particles to such an extent as to give rise to the bloody flux.

Specimens of the plant and salt were received from the Kina-gepur district, and yielded on analysis the following results:—The weed, dried at 130° C., was carbonised at a temperature below redness, and exhausted with boiling distilled water: the insoluble residue being subsequently incinerated until free from carbon.

	Per cent.
Total Ash	31·4583
Soluble Ash	6·1426
Insoluble Ash	25·3163

The sample of páná salt weighed about 2 lbs., it was slightly deliquescent, alkaline in reaction, and had the appearance of dirty common salt. Dried at 130° C. it had the following percentage composition:—

	Per cent.
Potassium Chloride	73·0916
Potassium Sulphate	22·6130
Potassium Carbonate	traces
Sodium Chloride	0·4727
Calcium Sulphate	0·5874
Magnesium Sulphate	0·2574
Ferric and Aluminium Oxides	0·0982
Sand and Silicic Oxide	0·3673
Organic Matter	0·3575
Water	1·8674

99·7125

Nitrates, nitrites, and phosphates were absent. Not the slightest trace of either bromine or iodine could be detected.

Lippia Mexicana. Dr. Podwissotzki. (*Pharm. Zeitschr. für Russland*, xxi. 925. From *Pharm. Journ.*) *Lippia Mexicana*, a verbenaceous plant which has been recently recommended as a remedy in asthma and the cough of phthisis, has been submitted to a chemical examination by the author, who reports that he has separated from it a tannin, a crystallizable colouring substance belonging to the quercetin group, an oxygenated essential oil, and a camphor. This camphor, which has been named "lippiol," and appears to be the principal representative of the medicinal activity of the plant, occurs in small quantity in the leaves, and

as it readily volatilizes, it may be easily lost in transport or keeping. It melts between 25° and 30° C., and in composition corresponds to menthol. In the presence of the essential oil ("lippienol"), which occurs in larger quantity, the camphor mixes with water, forming a white emulsion-like mixture, having a bitterish taste. The author considers his results to indicate that the best pharmaceutical preparation would be a tincture of the fresh plant, prepared with alcohol strong enough to dissolve both the camphor and the oil, in the proportion of one part by weight of the flowers and leaves to nine of alcohol.

Stachylarpheia Jamaicensis. F. Stearns. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 217.) This plant belongs to the order *Verbenaceæ*, and is used in Jamaica as an emmenagogue, under the name of "vervain." In Brazil it is called "jarboo," "urgevao," or "orgibao," and is applied externally for healing ulcerated wounds, and internally for rheumatism.

Macleya Cordata. R. B. Eykman. (*Archiv der Pharm.*, xx. 374.) This Japanese member of the *Papaveraceæ* contains two alkaloids, one of which appears to be identical with sanguinarin, prepared from *Sanguinaria canadensis*, and the other with the opium alkaloid, protopin, prepared by Hesse.

Sophora Japonica, Capparis Spinosa, and Ruta Graveolens. P. Förster. (*Dingler's Polytechn. Journ.*, 245, 48.) The glucosides isolated from these species yield similar products of resolution on boiling with dilute sulphuric acid, namely, isodulcite and a colouring matter similar to quercetin. That obtained from the ruta is, in fact, identical with quercetin (Zwenger and Dronke); that from sophora, though more similar, is yet distinct, and is therefore to be termed "sophoretin," and the glucoside "sophorin."

Chionanthus Virginica. J. M. Blackerly. (*Therapeutical Gazette*, 1882, 401.) The author speaks very highly of *Chionanthus virginica* as a remedy in chronic cases of enlarged and indurated liver. He states that in his hands it has proved superior to iridin, leptandrin, euonymin, podophyllin, or phosphate of sodium.

Geum Album. Dr. W. A. Spurgeon. (*Virginia Medical Monthly*, August, 1882.) The author says that this plant is useful as an anti-emetic, and that it relieves gastric irritation and headache. A teaspoonful of a tincture, representing eight troy ounces to the pint, is a dose, but larger doses may be given.

Frankenia Grandifolia, s. Velezia Latifolia. Dr. J. Moeller. (*Pharmaceutische Centralhalle*, 1882, No. 30. *Amer. Journ. Pharm.*, 1882, 514). This plant, known as *Yerba reuma*, grows near the sea-

shore from San Francisco to San Diego and southward, and eastward in the desert of Arizona and South Nevada. The author describes the drug as follows:—Stem ternate, somewhat woody, little branched, about 15 centimeters (6 inches) high; leaves decussate, small, obtusely ovate or spatulate, the upper ones more linear, entire, one-nerved, fleshy. The young leaves and branch tops are short, hairy, the older ones nearly smooth, sparsely hairy near the base, and slightly ciliate. The branches terminate with a flower, which has frequently two lateral flowers upon short branchlets, and an involucre formed from the two last pairs of leaves. The calyx is tubular, angular, four-ribbed and four-toothed; the petals are pale reddish, clawed, small. The dry herb is grey-green, inodorous, of a saline taste due to an incrustation of salt; after washing it is tasteless.

The Active Constituent of *Piscidia Erythrina*. E. Hart. (*Amer. Chem. Journ.*, 1883, 39.) The author has isolated the active principle of Jamaica dogwood. A pound of the fluid extract was well mixed with 30 grams of quicklime previously made into a thick paste with water; after digesting for half an hour the liquid was filtered, and water was added to the filtrate until it became slightly turbid; after two or three days crystals of the principle, for which the name *piscidin* is proposed, separated, accompanied with the resinous substance. By adding more water a second crop of crystals, still more impure, can be separated. The crystals are purified by re-crystallization from alcohol. The resinous matter, precipitated by water, retains a small portion of piscidin, of which the author thinks a pound of the fluid extract contains about one gram.

Elementary analysis led to the formula $C_{29}H_{34}O_8$. Piscidin crystallizes in nearly colourless prisms, melts at $192^{\circ}C$., is insoluble in water, slightly soluble in cold, much more in boiling alcohol, slightly soluble in ether, easily soluble in benzene and chloroform. It dissolves in cold concentrated hydrochloric acid, and is reprecipitated, apparently unchanged, by dilution with water. It dissolves in cold sulphuric acid, and separates again by addition of water, but it dissolves no longer easily in alcohol. Boiling with acids causes no separation of sugar. The alcoholic solution is neutral to test paper, and not precipitated by acetate of lead.

A previous notice of this plant will be found in the *Year-Book of Pharmacy*, 1882, p. 149.

Some Medicinal Plants of Ceylon. W. C. Ondaatje. (*Pharm. Journ.*, 3rd series, xiii. 818.)

1. *Randia dumetorum*, Lam.—The seeds of this tree are used by the natives of Ceylon and India as a reliable agent in producing emesis. No chemical examination seems to have been made to detect the active principle. It belongs to the same family (Cinchonaceæ) as *Cephaelis ipecacuanha*, and it would be important to determine if it contains emetine, more particularly since an allied species, *R. uliginosa*, is, according to Dr. Dymock, used in India as a remedy for dysentery. This species is also indigenous in Ceylon. The bark of *R. dumetorum* also possesses the same qualities.

The author has seen the powdered seeds used with as good effect as ipecacuanha, in doses of 5 to 10 grains. If analysis should prove *Randia* to possess the same active principle as ipecacuanha, a great saving might be effected by its substitution for the more expensive Brazilian drug.

2. *Sethia acuminata*, Arn.—This is a remedy much used by the Cinghalese as a vermifuge. The part used is the leaves, the juice of the leaves being mixed with sugar and castor oil, or with the powder of the leaves. The leaves are easily powdered when dried. Professor Bentley notices its vermifuge properties in his "Manual of Botany." Dr. Thwaites, in his "Enumeratio Plantarum Zeylanicæ," also refers to it. He says, "The Cinghalese attach much value to this plant as an anthelmintic for children, giving the juice expressed from the fresh leaves." It is chiefly used for expelling round worm, and possesses the advantage of not having a disagreeable taste. The powder is used in the dose of 10 to 15 grains.

3. *Coscinium fenestratum*, Colebr.—Many years ago the author found that it possessed *antiseptic* properties. Pieces of beef immersed in an infusion of the stem were preserved for several weeks. A weak infusion of the stem was also used as a lotion for foul ulcers with great success. It has been used also as a yellow dye. As this drug has recently been imported in quantity into England, it could easily be obtained, and an examination of the cause of its antiseptic properties seems desirable.

4. *Vateria Indica*, L.—The natives use it daily to arrest the alcoholic fermentation of the juice of the jaggery palm, *Caryota urens*, which is a favourite beverage with them. This property of preventing fermentation might be turned to account in some of the great manufacturing industries, if not in medicine, and the bark deserves chemical investigation.

5. *Semecarpus Gardneri*, Thw.—The black resin yielded by this tree, although not possessing medicinal properties, may be of some interest in the arts.

The resin is hard, breaks with a smooth fracture, burns with a bright flame, is soluble in turpentine, and adheres strongly to wood and metal. It is free from acidity. The formula for using the resin as a varnish is as follows:—

To a saturated solution of *Vateria Indica* resin in oil of turpentine, add by degrees pieces of black resin, and put it into a bottle and shake it well until the whole is dissolved, then apply it to wood or metal, which will give a varnish of great lustre and beauty. The resin should be first melted and strained through coarse calico or a sieve, to free it from impurities.

6. *Vernonia anthelmintica*, Willd.—This plant is cultivated by the Cinghalese, and is in great repute as a remedy, which is indicated by its name.

The seeds are black, of a bitter and nauseous taste, are easily procured from bazaars, and are commonly used by the village people for expelling the *ascaris lumbricoides*, and act as a vermicide. The dose of the powdered seed for an adult is from $\frac{1}{2}$ to 1 drachm. The native physicians prescribe it generally as a tonic in the shape of an infusion. The Cinghalese name is *sanne nayan*, and the Tamil name *kadoseragam*. European practitioners in India, from personal observations, confirm the truth of the above statement.

7. *Alstonia scholaris*, R. Br.—In 1865 the author forwarded to England, to his friend and correspondent, Mr. P. L. Simmonds, the editor of the *Technologist*, specimens of a kind of caoutchouc, as a substitute for gutta-percha.

The bark of this tree is thick and spongy. Its properties as a medicinal agent are fully described in the Pharmacopœia of India.

8. *Acorus calamus*, Linn.—The well-known sweet-flag is used as an anthelmintic, which property is not included in the Indian Pharmacopœia.

An infusion of the rhizome or root-stock given to young children acts effectually, and is often used in this way among the natives.

Madagascar Drugs. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xiii. 121 and 201.) The author's report contains notices of the following drugs:—

Roots.—Famamo or fanamamo (*Mundulia Telfairii*); fisava; Hazomafàna, the produce of a species of *Daphne*; mahatatidy; matsàtsorana; mainàkimafy; raingeraingy; raisàonjo; rovy; Sanàtry; tangèn (*Tunghinia venenifera*); tsiankoditra drevo; tsibitrafototra (*Cassytha jiliformis*); tsilanky; tsilèondroàhy; ramy, probably the produce of *Cunarium Colophania*.

Barks and Woods.—Hafotra fotsy; havoza; mandravorotra (*Betsileo*); nato.

Leaves and Flowers.—Famamo (*Mundulia Telfairii*); fanjanandra, the leafy shoots of *Anthospermum plicatum*; haronga, the leaves or twigs of *Haronga Madagascariensis*; nifin akanga (*Commelyna Madagascariensis*); rambiazana; sangon, the flowers of *Hyptis pectinata*; hanidraisà, the leafy twigs of *Aphloia theaeformis*; tsiavaramonina.

Fruits and Seeds.—Landemo or tendemilahy, the fruits of *Anthocleista Madagascariensis*; sèna sèna; taimbòron tsiloza (*Chenopodium ambrosioides*); tangena; tànantànama-fotsy (*Curcas purgans*); tànantàna-mànga (*Ricinus communis*); tantèrakala (*Embelia micrantha*); vòtolàlaka, the grey seeds of *Cæsalpinia Bonducella*; veraka, the fruits of *Schrebera Golungensis*; voantamènaka-vavy (*Quisqualis* species).

Psoroma Crassum. G. Spica. (*Gazz. Chim. Ital.*, xii. 431-435; *Journ. Chem. Soc.*, 1883, 80.) This lichen grows in a few localities in Sicily, and the small quantity with which the author's experiments were made was gathered near Dahlia, province of Caltanissetta. By exhaustion with ether in a percolator, it yielded a yellow substance (A), crystallizing in needles from the ether on cooling, and a brown residue (B), which remained in considerable quantity on distilling off the solvent.

The crystallized body is soluble in warm alcohol, ether, chloroform, and acetic acid, and recrystallizes from these solvents more or less on cooling; but benzene, unless employed in large excess, dissolves only a part of it, leaving a nearly white crystalline residue. The constituent soluble in benzene was purified by repeated crystallization from that liquid; the insoluble portion by crystallization from alcohol and repeated washing with cold alcohol.

The yellow substance crystallized from benzene is usnic acid, $C_{18}H_{18}O_8$, melting at $195-197^{\circ}$, and yielding a sodium salt, $C_{15}H_{17}NaO_8, 2H_2O$, which crystallizes from warm water in stellate groups of needles.

The white substance only slightly soluble in benzene crystallizes from alcohol in silky needles, dissolves in the solvents above mentioned, and to a slight extent in water, to which it imparts a faint acid reaction. It dissolves also in alkalies and alkaline carbonates, and in sulphuric, nitric, and hydrochloric acids, melts with decomposition at $263-264^{\circ}$, and begins to sublime, but resolidifies at a high temperature, about 215° . Dried at 100° , it gave on analysis, 60.23-60.29 per cent. carbon, and 3.71-3.97 hydrogen,

leading to the formula $C_{20}H_{14}O_9$, which requires 60.30 carbon and 3.51 hydrogen. Its silver salt, obtained by precipitation, forms white flocks, which alter on exposure to light. The analysis of this salt leads to the formula $C_{20}H_{15}AgO_{10}$, showing that the corresponding acid (*psoromic acid*) has the composition, $C_{20}H_{16}O_{10}$, and that the compound, $C_{20}H_{14}O_9$, extracted from the lichen as above described, is not the acid but the anhydride. The acid itself has not been obtained in the free state.

Psoromic anhydride boiled with aniline is converted into a crystalline yellow substance, which when further heated does not melt, but decomposes, yielding a carbonaceous residue, and a liquid having a characteristic acetic odour, probably psoromic anilide. The anhydride heated with water in sealed tubes, at 240° , yields a yellow-brown liquid and a brown residue, which, as well as the residue left on evaporating the solution, exhibits the characters of an acid, and gives, with ferric chloride, a dark green coloration not produced by psoromic acid.

The brown residue *B*, left on evaporating the ether used for the extraction, yields to benzene a small quantity of a resinous substance, together with psoromic acid.

The lichen, after exhaustion with ether, yields to boiling alcohol a substance having the characters of a wax. This the author reserves for further examination.

Lycoperdon Giganteum. Dr. E. Thompson. (*Pharm. Journ.* From the *Lancet*, July 29th, 1882, 136.) The author recalls attention to the use of the giant puff-ball, *Lycoperdon giganteum*, as a local hæmostatic. He states that it forms a most soft and comfortable surgical dressing, and that the powder it contains seems to possess antiseptic and anodyne properties. The mature plant is used. At this period it is about the size of a child's head and is covered with a thin skin; the latter is removed, and the capillitium and spores, which form a dusty mass, are used. Mr. Fagan, a leading surgeon in Belfast, found that it at once restrained bleeding from arteries in the bone in the neighbourhood of the orbit, after the failure of other means. The researches of Hayem on the reason of the coagulation of the blood, show that the hæmostatic action of the puff-ball, as well as of all other spongy or powdery substances, depends upon the fact that healthy blood deposits hæmatoblasts, or minute corpuscles, on any foreign substance introduced into a vein, which become adhesive points for the subsequent attachment of particles of fibrin. This action, however, also takes place when the vessels themselves assume abnormal conditions, as when cut or

altered by disease. The hæmatoblasts undergo change and become confluent more rapidly under the influence of warmth, which explains the power of warm water to arrest hæmorrhage. The hæmorrhagic tendency is believed to depend upon the absence from or small quantity of hæmatoblasts in the blood, since transfusion of blood has been found to arrest hæmorrhage in such cases.

Larch Agaric (*Polyporus officinalis*). E. Jahns. (*Archiv der Pharm.*, xxi. 260.) The composition of this plant has been re-investigated by the author. He finds it to yield to hot alcohol: (1) 16 to 18 per cent. of a bibasic triatomic acid (Fleury's "agaricic acid"), homologous with malic acid, being represented by the formula $C_{16}H_{30}O_5 + H_2O$, and which melts at 138–139° C.; (2) 3 to 5 per cent. of a neutral body, apparently an alcohol, crystallizing in needles, melting at 271–272°, and capable of sublimation; (3) 3 to 4 per cent. of a white amorphous body which separates in a gelatinous form from solutions; and (4) 25 to 30 per cent. of an amorphous, red, resinous mixture, of acid reaction, easily soluble in alcohol and ether, and having a bitter taste. This mixture contains the active purgative principle of *Polyporus officinalis*, and is the "larch fungus resin" and "red resin" of other authors. The author considers agaricic acid, which Fleury represented by the formula $C_{24}H_{44}O_7$ (*Pharm. Journ.* [3], vi. 862), to be identical with the "laricin" of Martius, and essentially the same as the "agaricin" of Schoonbroodt, and probably as the "pseudowax" of Trommsdorff. The silver, potassium, sodium, ammonium, and barium salts of agaricic acid are described.

Agaricus Ruber. T. L. Phipson. (*Chemical News*, 1882, 199.) This fungus contains a rose-red colouring matter, ruberin, which appears bright blue by transmitted light; being soluble in water, it is washed out of the head of the fungus by a heavy fall of rain. Ether extracts from the fungus a yellowish white alkaloid, agarythrine, which has a bitter, afterwards burning, taste, somewhat like aconitine; its chloride is soluble, but the sulphate insoluble, in water, the latter dissolving in alcohol; it dissolves in nitric acid with a red colour, and is coloured red by chlorinated lime, and afterwards bleached. On agitating the solution of the alkaloid with ether, it is oxidized by the air to a red colouring matter, which is probably the cause of the red colour of the surface of the fungus.

Ergot. C. S. Hallberg. (*Pharm. Journ.*, 3rd series, xiii. 628, 629; *Journ. Chem. Soc.*, 1883, 640.) In order that ergot may be obtained in a condition in which it may be kept without becoming worm-eaten, etc., so that its most valuable medical constituent may

be retained, whilst the useless substances are removed; and finally, to insure that it may be worked up into pills, etc., with facility, the author recommends the following treatment:—Light petroleum (sp. gr. 0.716), which has been purified by shaking with sulphuric acid, washing, and distillation, is allowed to percolate through coarsely powdered ergot; this removes the fixed oils. It is then extracted with strong alcohol, which displaces the petroleum and takes up 2 to 3 per cent. of resinous matter and the poisonous alkaloid, ergotine. During this process the ergot loses 25 to 30 per cent. in weight, and the prepared ergot is therefore stronger than the crude drug. This coarse powder, when pulverised, may be administered as such. Oil of ergot, constituting 25 to 30 per cent. of the ergot, is very heavy, dark brown, and almost odourless; pearly stellate tufts (*cholesterin*?) sometimes separate from it. The oil yields an orange-yellow soap, which has been recommended in skin diseases; the oil is an excellent lubricator for machinery. Tested for alkaloids by treatment with dilute sulphuric acid, caustic soda, and finally, citric acid, the oil yielded a crystalline substance, not an alkaloid, but probably *sclerocrystallin*. An attempt to extract the alkaloid from the alcoholic extract proved fruitless. The remainder of the paper relates to various pharmaceutical preparations, such as fluid ergot, made by extracting the prepared ergot with water by maceration, etc., alcohol is subsequently added; the author is of opinion that not more than 25 per cent. of alcohol ought to be added, this quantity being quite sufficient to precipitate the gummy matter, whilst a larger quantity would remove some valuable constituents. For pills, powders, etc., the fluid ergot extract is evaporated down and mixed with milk sugar.

Poisonous Principles contained in certain Lupines. C. Arnold. (*Ber. der deutsch. chem. Ges.*, xvi. 461, 462.) A resinous compound may be obtained from diseased lupines, by digesting them for two days at a temperature of 40–50° in a 2 per cent. solution of sodium hydroxide. The extract is neutralized with acetic acid, and concentrated by evaporation at a temperature not exceeding 60°. After carefully precipitating the legumin with strong acetic acid, the filtrate is gently evaporated to a syrup, and poured into 15 times its volume of 90 per cent. alcohol. The resinous precipitate is slowly soluble in water. A dose of 10 grams of this substance causes cattle to exhibit the usual symptoms of poisoning by diseased lupines.

Poisonous Properties of the Juice of the Cassava Root. (*Chem. and Drugg.*, Nov., 1882.) The sweet cassava (*Manihot Aipi*) and

the bitter cassava (*M. utilisima*) are very extensively grown in the West Indies and South America for their edible tubers, much used as a culinary esculent, and for the starch obtained by grating and washing, which is converted into tapioca. The milky sap of the latter species has long been known to be a strong vegetable poison, which is destroyed through pressing the grated root in the first instance, the remaining acidity being expelled by the heating process.

In 1796, Dr. Clark, of Dominica, describing the fatal effects resulting to negroes from drinking bitter cassava juice, compared the action of the poison to prussic acid, and Dr. Fennon, by experiments made at Cayenne, proved that the poison, like prussic acid, was volatile, and could be isolated by distillation.

Subsequently, Messrs. Henry and Boutron-Charlard, by analysing bitter cassava juice imported into France, ascertained that the poison was prussic acid. In 1838 Dr. Christison confirmed their discovery by an examination of some well-preserved juice from Demerara.

Notwithstanding this early identification of the poison, no attempt had apparently been made to determine the quantity yielded by the plant until 1877, when Mr. E. Francis undertook an inquiry into the subject, the results of which he has recently published in the journal of the Royal Agricultural and Botanical Society of British Guiana.

An examination was made, not only of bitter cassava, but also of a number of samples of sweet cassava, and, contrary to expectation, the latter were found to contain nearly as much prussic acid as the former. Fifteen samples of sweet cassava were obtained from different cultivators in Trinidad, and every one of them contained prussic acid, nine out of the number (or 60 per cent.) yielding sufficient, from one pound of the root or half-pint of the juice, to kill an adult. The following summary shows the average, as well as the highest and lowest, quantities of prussic acid that were met with in 15 samples of sweet and 10 samples of bitter cassava:—

Sweet Cassava (15 Samples).

	Percent. of Prussic Acid.	Grains of Prussic Acid per lb.
Average	·0168	1·175
Highest	·0238	1·666
Lowest	·0113	0·791

Bitter Cassava (10 Samples.)

	Percent. of Prussic Acid.	Grains of Prussic Acid per lb.
Average	·0275	1·927
Highest	·0422	3·094
Lowest	·0132	0·924

The juice of the bitter cassava, mixed with molasses and fermented, has been made into an intoxicating liquor, which is much relished by negroes and Indians. The concentrated juice, known in the colony of British Guiana as cassareep, is an Indian preparation. One of its most remarkable properties is its highly antiseptic power, preserving meat that has been boiled in it for a much longer period than can be done by any other culinary process.

Contributions to the Knowledge of the Pharmacological Group of Digitalin. O. Schmiedeberg. (*Chem. Zeitung*, 1883, 204.) From oleander leaves, from Tunis, the author has separated as active constituents the so called *neriantin*, or oleander-digitalin, and *oleandrin*. The oleandrin possesses all the properties which characterise the digitalin group, while neriantin is to be regarded as a glucoside, and has only a feeble action. The author has furthermore isolated from the North American *Apocynum cannabinum*, L., two substances which belong to the digitalin group, namely, *apocynin* and *apocynein*. The former has a violent action, similar to oleandrin, while the latter is a glucoside, and of much more feeble action.

Animal Products in the Chinese Materia Medica. F. Newcome. (From a paper in the *Medical Press and Circular*, Sept. 13th, 1883.) Of animal products, musk probably stands highest in repute among Chinese doctors; but owing to prohibitive prices, the use of it is confined exclusively to the wealthier classes. For the pure unadulterated article, obtained from the male *moschiferus*, or Thibet musk, from 20s. to 40s. an ounce is the common price to pay, and extensive adulteration is the result of this high price. In 1881, the total exportation from China amounted to 1,877 catties, or say 2,503 lbs., valued at 149,780 taels, or about £41,501; in other words, the average was something like a guinea an ounce, whereas true musk always fetches from 30s. to 60s. an ounce at Shanghai or Tientsin.

Bezoar stones are equally in repute, almost fabulous sums being given for the genuine article. For *Bezoar bovine*, classified in the

returns of trade as "cow bezoar," the export price varies from 400 to 500 taels the catty; that is to say, from £6 to £7 10s. per ounce. Probably, however, several kinds of bezoar, including stones derived from animals of the goat tribe, are included under the generic term.

The Chinese also import a considerable quantity of Indian cow bezoar. This, after transport to China, is only worth about 8s. to 9s. an ounce, or barely one-twentieth that of the genuine native article. Beargall is another expensive animal product, being commercially worth some 16s. an ounce in Shanghai; but for what medical purposes it is used the author does not know.

Beeswax plays a by no means unimportant rôle in Chinese medicine, forming the base of most ointments and plasters, in the manufacture of which an enormous quantity is annually consumed.

Preparations of *Blatta Orientales*. T. Bogomolow. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 210.) The author confirms the value of these beetles in dropsical affections, and has not observed any irritating or other injurious effects. He has administered them in many cases, both in the form of powder and in that of a tincture, and arrives at the conclusion that the latter is preferable. The tincture is prepared by digesting two ounces of the powder with sixteen ounces (by weight) of rectified spirit for three days. Dose: a teaspoonful three times a day; for children, twenty drops each time.

***Doryphora Decemlineata*.** J. D. Forbes. (*Amer. Journ. Pharm.*, 1882, 550.)

Experiments with the Live Beetles.—The beetles were mashed in a mortar and macerated with different solvents.

Alcohol yielded a dark oily extract having the characteristic odour, and when mixed with an equal quantity of resin cerate produced no irritation of the skin. The extract, redissolved in alcohol and mixed with carbon bisulphide, separated into three layers, the lowest of which was dark brown and soluble in water; neither this nor the two light-yellow layers above produced irritation of the skin.

Acetic ether yielded a tincture which, on treatment with carbon bisulphide, separated likewise into three layers, in neither of which the presence of cantharidin was indicated.

Benzin used as a menstruum, and the product treated with bisulphide of carbon, yielded a dark oil and extractive matter, but no trace of cantharidin.

The beetles were exhausted with potassa solution, the liquid

neutralized with acid, evaporated, the residue treated with water, and the undissolved portion taken up with alcohol; on evaporation a dark granular mass was left, which, mixed with an equal weight of resin cerate, produced on the skin in three hours slight irritation and redness.

Experiments with the Dried Beetles.—The beetles were killed with ether, dried, powdered, and exhausted by chloroform. On treating the product with carbon bisulphide a supernatant, dark, oily layer and a heavier light-brown liquid were obtained, of which the former, when applied to the skin of two persons, produced a tingling, burning sensation, and in twelve hours vesicles formed under the irritated surface. The remaining solution, evaporated to dryness and mixed with resin cerate, produced only slight irritation.

It follows from the above that the potato bug contains a vesicating principle, but it is uncertain whether it be identical with cantharidin.

American Musk. R. S. Christiani. (*Pharm. Journ.*, 3rd series, xiii. 110.) One of the most important substances for the perfuming of toilet soaps is musk; it is also the most expensive, and owing to the large amount of adulteration it is the most unsatisfactory article the manufacturer has to use.

Much of this trouble and expense can be avoided by the use of "American musk," obtained from the musk rat, the well-known rodent, native of the United States and found in nearly all parts of it, frequenting the streams and marshes, and having habits similar to the beaver.

The musky secretion is found in two sacs, situated between the anus and the genital organs, and is emitted by the animal when excited. These animals are easily trapped and killed for their skins, which are shipped in large quantities to Europe.

To the manufacturer of toilet soaps the American musk is almost invaluable, being nearly as good and as strong as the real. The alkalinity of the soap improves and modifies the odour, which is also improved by the addition of the spice oils and other perfuming substances.

Cantharidin and Cantharidates. E. Dietrich. (*Chem. and Drugg.*, from *Pharm. Zeitung*.) The author says that the greater part of cantharidin in Spanish flies exists in combination with ammonium, magnesium, sodium, etc., and but a small quantity is free. The cantharidates are only soluble in water and glycerin, while free cantharidin is soluble by alcohol, ether, oils, etc., and but

slightly soluble in water (1 part in 30,000 parts of cold or 15,000 of hot water). The cantharidates decompose when exposed to air, absorbing carbonic acid, while cantharidin is liberated. Contrary to the general statement, the author finds cantharidates to be dialyzable, and he adopts this method in the manufacture of cantharidin. The presence of cantharidin may be determined by preparing its potassium salt, decomposing this with sulphuric acid, extracting the cantharidin with chloroform, and evaporating the latter. The residue examined with a microscope and the aid of polarized light would show its peculiar crystalline structure, if present. The author estimates that 1 gram of cantharidin is equal to 200 grams of cantharides.

The Adulteration of Cochineal. Dr. J. Loewe. (*Dingl. Polyt. Journ.*, cexlvi. 90. From *New Remedies*.) Commercial cochineal appears in two forms, according to the method used in killing the insects; namely, either as dull grains covered with a white dust, or as shining, blackish brown grains, free from dust.

The whitish variety has long been known to have been subject to adulteration, by being weighted with 10–12 per cent. of mineral substances—such as sulphate of barium, carbonate or sulphate of lead, chloride of lead, talcum, etc.—mostly all such substances as combine a high specific gravity with small bulk. The amount of such impurities may generally be detected by estimation of the ash of the cochineal: the unadulterated drug yielded not much over 0.5 per cent. of ash.

On account of the frequent adulteration of the white variety, purchasers fell into the habit of demanding the dark, undusted kind, which appeared to offer a better guarantee of purity. But even this has, of late years, been frequently found adulterated with various substances, as binoxide of manganese, sulphide of lead, ferric oxide, etc.

The method of adulteration, in this case, is generally so perfect that even a good judge will often be unable to detect it by mere inspection. It was, therefore, of interest to ascertain by what means this adulteration is so skilfully performed, and a series of experiments soon led to the discovery of the method.

To moisten cochineal with a cold adhesive liquid, such as solution of gum, etc., and then to add the weighting material, does not lead to the desired result, since the accompanying water extracts colouring matter from the cochineal, which imparts a red colour to the added mineral matters, and thereby detracts from the appearance of the article. Besides, the foreign substance does not penetrate suffi-

ciently into the ridges of the insect, and only adheres to it very superficially, so that it may be easily recognised.

By the following method, however, the weighting may be done perfectly, and it is this method which is used, on a large scale, by the adulterators.

Cochineal is cautiously exposed to an atmosphere of steam, great care being taken that it does not come in contact with any water of condensation, but be merely enveloped in steam. The grains thereby swell up to several times their volume, and from their ridges exudes a very small amount of strongly adhesive red juice, which serves as a glue for the weighting material to be added. As soon as the grains cease to increase in bulk, they are removed from the atmosphere of steam, and transferred in a suitable vessel, flask, drum, etc., when the mineral substance is added (up to 10 or 12 per cent.), and the vessel is set in rotary motion until the material is completely taken up by the adhesive juice adhering to the insects. The grains are then removed and dried in a current of warm air, when they contract to their previous volume, and retain the weighting material concealed within their folds and ridges. By this method white mineral substance afterwards added remains uncoloured, and the dark substances previously incorporated remain undetected.

It appears, therefore, to be, under all circumstances, advisable to purchase only such cochineal as has been found pure on estimating the ash. It is true that this might also be made nugatory if organic substances were used as adulterants; for instance, flour as "white substance," and asphaltum as "dark substance." Yet, if this were done, the real purpose of adulteration would not be attained, since these substances have but a small specific gravity compared with their volume, and would, therefore, not likely be chosen.

Beeswax. E. Zatzek. (*Monatsh. Chem.*, iii. 677-679.) Schalfef has stated that Brodie's cerotic acid is in reality a mixture of acids, into which it may be resolved by fractional precipitation with lead acetate. The author has repeated these experiments, but entirely fails to confirm Schalfef's results. The first fraction which, according to Schalfef, should contain an acid, $C_{34}H_{68}O_2$, gave numbers perfectly agreeing with those required for cerotic acid ($C_{27}H_{54}O_2$).

Wax and its Adulterants. E. Dietrich. (*Archiv der Pharm.*, [3], xx. 454.) The following is a table of the specific gravity of wax, together with various substances employed to adulterate it:—

	Sp. Gr.
Cera alba	0.973
„ flava	0.963-0.964
„ japonica	0.975
Ceresin, white	0.918
„ half white	0.920
„ yellow	0.922
Ozokerite (crude)	0.052
Cetaceum	0.960
Colophon. Amer.	1.108
„ Gallicum	1.104-1.105
Oleum Cacao Filtratum	0.980-0.981
Paraffin	0.913-0.914
Res. Pini depurat.	1.045
Sebum bovinum	0.952-0.953
„ ovillum	0.961
Stearin	0.971-0.972

Mixtures.

Yellow Wax. Sp. Gr. 0.963.	Yellow Ceresin. Sp. Gr. 0.922.	Mixture. Sp. Gr.
80 parts	20 parts	0.957-0.958
60 „	40 „	0.950
40 „	60 „	0.937
20 „	80 „	0.931

White Wax. Sp. Gr. 0.973.	White Ceresin. Sp. Gr. 0.918.	Mixture. Sp. Gr.
80 parts	20 parts	0.962
60 „	40 „	0.957
40 „	60 „	0.938
20 „	80 „	0.932

Comparative Value of Benzoin and Styra in the Preservation of Ointments. B. F. Scholl. (*Amer. Journ. Pharm.*, 1883, 88.) A tincture of storax was prepared of the same strength as tinctura benzoini, U. S. Pharmacopœia, 1870 (three troy ounces to one pint of alcohol). This and tincture of benzoin was used in a series of experiments commenced April 3rd, 1881. Pure fresh lard was obtained and the following mixtures made, following the pharmacopœia process:—

1. Lard,	3j . .	Tincture of Styra,	3j
2. Lard,	3i . .	Tincture of Styra,	3ss
3. Lard,	3i . .	Tincture of Styra,	ʒ xv
4. Simple Cerate,	3j . .	Tincture of Styra,	3j
5. Simple Cerate,	3j . .	Tincture of Styra,	3ss
6. Lard,	3j . .	Tincture of Benzoin,	3j
7. Lard,	3j . .	Tincture of Benzoin,	3ss

The specimens were put in wide-mouthed bottles, loosely covered with paper so as to admit the air, but exclude the dust, and were then placed on a shelf in the store, where they were exposed to the light and heat during the warm summer months. On examining them from time to time, Nos. 2 and 3 were found rancid and unfit for use, August 30th, while all the rest were still in good condition.

October 20th, a perceptible change was noticed in Nos. 1 and 5, and a short time afterwards they were found to have become rancid. One month later No. 7 began to show signs of becoming rancid.

Evidently benzoin is preferable to styrax for the preservation of ointments; but if the latter are to be used within two or three months, styrax would answer very well as a preservative.

Acid Nature of some kinds of Vaseline. Dr. Lenz. (*Archiv der Pharm.* Sept., 1882.) Vaseline, as met with in commerce, often contains sulpho-acids and traces of sulphate of calcium. The author examined six samples from various sources, and, for comparison, a sample of prepared lard from an apothecary's shop, the results of which are indicated by the amount of NaHO required to neutralize 100 grams of the substance operated on.

The samples of vaseline required respectively 243, 231, 218, 130, 96, and 91 mg. of NaHO , while the sample of prepared lard only required 14 mg.

Such a proportion of acid would be obviously detrimental to the employment of vaseline for therapeutical purposes. Further experiment, however, convinced the author that the samples referred to must have been exceptional ones, since samples subsequently examined by him required only from 6 to 8 mgs. of NaHO , a result which also agrees with analyses recently made by M. Fullman.

Oleates in Medicine. Dr. J. Sawyer. (*Brit. Med. Journ.*) The author directs attention to the therapeutic use of the oleates. A short time ago Dr. Shoemaker read an important paper before the Medical Society of Pennsylvania, on "The Preparation and Uses of Oleates." He claims to have introduced the use of chemically true oleates, in contradistinction to those previously prepared by the direct union of the acid with the base, with or without heat. The new oleates are obtained by the double decomposition of sodium oleate with solutions of neutral salts, the sodium oleate being prepared by the saponification of oleic acid with a solution of sodium hydrate. A solution of the sodium oleate in eight parts of water is precipitated by a neutral salt, and the precipitate, washed and dried, is the oleate required. Messrs. Southall Bros.

& Barclay have prepared various oleates according to Dr. Shoemaker's directions, and some of these, namely, the oleates of lead, zinc, and copper, Dr. Sawyer has tested in practice. The new oleates can be used as dusting powders as well as in the form of ointments, so that they may be employed in those troublesome acute and discharging affections of the skin in which greasy preparations of any kind cannot be borne. Zinc oleate, which is a fine pearl-coloured powder, with a soft, soapy feel, like powdered French chalk or lead oleate, may be used alone as a dusting powder for the skin, or it may be so used diluted with powdered starch. One drachm and a half or two drachms of either of these oleates, mixed with an ounce of petroleum jelly or benzoated lard, makes a good ointment, which Dr. Sawyer has found efficient in cases of subacute and chronic ezema. Dr. Shoemaker has introduced oleate of copper as a remedy for ringworm. Dr. Sawyer has used this in the form of ointment, of the strength of $1\frac{1}{2}$ drachms of the oleate to $6\frac{1}{2}$ drachms of petroleum jelly, in some mild cases of ringworm, with excellent result.

Detection of Castor Oil as an Adulterant in Oil of Almonds. (*Chem. and Drugg.*, May, 1883.) On shaking with ammonia pure almond oil gives a perfect emulsion, whereas in the presence of only 5 per cent. of castor oil drops of oil separate at the bottom, the quantity increasing, of course, with the percentage of castor oil present. Another method is that based on the formation of cenanthol from castor oil. The sample is mixed with rectified spirits of wine, the alcoholic solution evaporated on a water-bath, and mixed with quicklime and concentrated caustic potash. On heating it now in a test-tube, the characteristic smell of cenanthol is produced if any castor oil be present.

Use of Cotton-seed Oil in Pharmacy, and Detection of this Oil as an Adulterant of Olive Oil. S. S. Bradford. (*Amer. Journ. Pharm.*, October, 1882.)

Emplastrum Plumbi.—The making of this plaster with cotton-seed oil has been questioned, as according to some authorities the product is not of good consistence, and is apt to be soft, sticky, and dark-coloured; but in my experience such is not the case. If the U. S. P. process is followed in making this plaster, substituting for the olive oil cotton-seed oil, and instead of half a pint of boiling water, $1\frac{1}{2}$ pint are added, the product obtained will be equally as good as that from olive oil.

Linimentum Ammoniac.—This liniment, made with cotton-seed oil, is of much better consistency than when made with olive oil.

It is not so thick, will pour easily out of the bottle, and if the ammonia used is of proper strength, will make a perfect liniment.

Linimentum Calcis.—Cotton-seed oil is not at all adapted to making this liniment. It does not readily saponify, separates quickly, and it is almost impossible to unite when separated.

Linimentum Camphoræ.—Cotton-seed oil is far superior to olive oil in making this liniment, it being a much better solvent of camphor. It has not that disagreeable odour so commonly found in the liniment.

Linimentum Chloroformi.—Cotton-seed oil being very soluble in chloroform, the liniment made with it leaves nothing to be desired.

Linimentum Plumbi Subacetatis.—When liq. plumbi subacet. is mixed with cotton-seed oil and allowed to stand for some time, the oil assumes a reddish colour similar to that of freshly-made tincture of myrrh. When the liquor is mixed with olive oil, if the oil be pure no such change takes place. Noticing this change, it occurred to the author that this would be a simple and easy way to detect cotton-seed oil when mixed with olive oil. This change usually takes place after standing from twelve to twenty-four hours. It is easily detected in mixtures containing 5 per cent. or even less of the oil.

A Fraudulent Substitute for Glycerin. Prof. Lagoux. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 286.) The fictitious glycerin reported upon by the author, and met with by him in the French market, proved to be a saturated solution of Epsom salts mixed with 16 per cent. by weight of commercial glucose.

The Testing of Glycerin. F. Jean. (*Journ. de Pharm. d'Alsace-Lorraine*, ix. 136. From *Pharm. Journ.*) The author has studied and described the adulterations of glycerin, and the imperfections in manufacture. He states that oxide of lead, lime, and butyric acid are the impurities most frequently met with in commercial glycerin, and that they accrue from bad manufacture or incomplete purification. Perfumers test glycerin with nitrate of silver, no sensible coloration resulting at the end of twenty-four hours if it be pure.

The chloroform test consists of mixing equal parts of chloroform and glycerin, stirring, and then leaving the mixture to settle. The mixture separates into two distinct layers, the upper one consisting of pure glycerin, the lower of chloroform and the glycerin impurities. If the glycerin is pure, the chloroform remains clear; if not, a greyish belt is observed at the point of separation.

If to glycerin, diluted with its own volume of distilled water, first a few drops of dilute sulphuric acid, and then a little alcohol, be

added, a white precipitate may be observed if the glycerin is impure. This will be due to the presence of lime or lead, the latter being indicated if the precipitate is blackened by sulphuretted hydrogen.

The presence of butyric acid is detected by mixing strong alcohol and sulphuric acid with the glycerin, and heating slightly, when the agreeable odour of butyric ether becomes manifest.

Formic and oxalic acids have also been found in glycerin; their detection is very important, especially in glycerin destined for pharmaceutical preparations. This may be effected by mixing equal parts of the impure glycerin and sulphuric acid, sp. gr. 1.83, when carbonic acid gas is given off.

To ascertain if both the above acids, or, if only one, which, is present in the glycerin, M. Jean uses the following tests:—

1. To a part of the glycerin alcohol of 40° is added, and a drop of sulphuric acid, and slight heat applied; the odour of formic ethyl (peach-flower smell) indicates the presence of formic acid.

2. To equal quantities of glycerin and water add two drops of a solution of chloride of calcium containing a little ammonia (free from carbonate); if oxalic acid be present a white precipitate of oxalate of lime will be formed.

Sugar, glucose, gum, and dextrine are easily discovered by the following tests:—150 or 200 drops of distilled water are poured on the glycerin to be tested in a porcelain cup; three or four centigrammes of molybdate of ammonia and a drop of pure nitric acid are added, and the whole is then boiled for half a minute. If the glycerin contains sugar or dextrine a blue coloration is produced. If glycerin adulterated with cane-sugar be boiled with a few drops of strong sulphuric acid a black colour is produced, due to the carbonization of the sugar. Adulteration with glucose is detected by means of caustic soda, the mixture having a brown colour when boiled. To ascertain the quantity of sugar, dextrine, or glucose in glycerin, the following process may be employed:—5 grams of the impure glycerin are boiled in a small glass beaker with 5 c.c. of distilled water and a slight excess of alkaline solution of tartrate of potash and copper; the precipitate of protoxide of copper is redissolved by adding some hydrochloric acid. The solution is then made strongly ammoniacal, and poured into a solution of nitrate of silver. Metallic silver is immediately precipitated, which is separated by filtration. After washing it with warm ammoniacal water it is calcined at a red heat, and the weight of the silver taken. As 100 of glucose = 509.6 of metallic silver, the weight of the glucose can be easily calculated. If cane-sugar or dextrine be present, it is

necessary previously to boil the glycerin for half an hour with acidulated water, in order to convert these matters into glucose.

The quantity of water contained in impure glycerin can be determined, when the density is known, by means of Vogel's formula.

Valuation of Commercial Extracts of Logwood. Reinhard. (*Zeitschr. für Analyt. Chem.*, 1882, 599.) The author determines the percentages of water, the portion soluble in ether (hæmatoxylin), the portion soluble in alcohol (hæmatein), and the residue insoluble in both. Some of his results are shown in the following table:—

	Hæmatoxylin.	Hæmatein.	Insoluble Portion.	Water.
French Extract . .	54.6 p.c.	20.0 p.c.	10.2 p.c.	15.2 p.c.
American Extract .	51.4 „	10.8 „	17.4 „	20.4 „
So-called Hæmatein.	54.5 „	28.7 „	6.7 „	10.1 „

Testing of Commercial Logwood Extracts. E. Lanber. (*Ibid.*) In order to detect an adulteration of the extract with molasses or other fermentable substances, the author suggests the treatment of the aqueous solution with yeast, and determination of the alcohol after the completion of the fermentation.

The Testing of Extract of Licorice. C. L. Diehl. (*New Remedies*, May, 1883.)

1. Expose 1 gram of the mass to a gentle heat until it experiences no further loss in weight. Calculate this loss as moisture.

2. Digest 10 grams of the mass contained in a flask with 100 grams of distilled water until it is fully disintegrated; when cold cautiously pour on 200 grams of alcohol, and vigorously shake the flask. By this procedure the precipitate produced will be prevented from adhering to the sides of the vessel. Allow it to stand for several hours, shaking occasionally; then pour on a double thick filter of sufficient size, and wash the remaining dregs with a mixture of two parts of alcohol and one part of water until the filtrate begins to pass colourless.

3. After the foregoing residue has become air-dry, exhaust the same with distilled water, so that the filtrate may pass colourless; reduce the latter to a small volume, and then transfer to a small tared porcelain capsule, being careful to remove any residue from the larger evaporating dish by means of a little warm distilled water, adding the rinsing to the contents of the small capsule. Evaporate to dryness by means of a gentle heat, and calculate the residue as gummy matter.

4. Carefully dry the dregs remaining on the filter under No. 3, employ the outer filter as counterbalance, and calculate as insoluble substance.

5. Carefully concentrate the alcoholic filtrate obtained under No. 2 to the consistence of syrup, and redissolve in distilled water. Then, to the clear solution add dilute sulphuric acid, gradually, until a precipitate (glycyrrhizin) ceases to be produced. Wash the glycyrrhizin with cold water, allow to dry at the ordinary temperature, and dissolve in strong alcohol, whereby about fifteen per cent. of insoluble tasteless residue will remain, which, however, is soluble in ammonia. Now filter the alcoholic solution of glycyrrhizin, wash the filter with alcohol, evaporate the combined filtrates to dryness, then redissolve the residue in a small quantity of ammonia, again evaporate to dryness in a tared capsule, and estimate as ammoniated glycyrrhizin.

Extracts of Aloes. R. Aitken. (*Pharm. Journ.*, 3rd series, xiii. 501.) In the preparation of these extracts from Socotrine or Barbadoes aloes, the B. P. directs the evaporation to be conducted either by means of a water-bath or a current of warm air. The author has carefully compared both methods, and finds that the last-named mode of evaporation only yields an extract free from resin, and is therefore much to be preferred. Commercial samples of extract were found to contain resin varying from a mere trace to 20 per cent., most of them between 10 and 20 per cent.

Liquid Extract of Cinchona. Dr. B. H. Paul. (*Pharm. Journ.*, 3rd series, xiii. 737.) The experiments recorded by the author afford further and striking proofs of the unsatisfactory nature of the official liquid extract of cinchona. It is shown that the B. P. process renders available only one-seventh part of the alkaloids contained in the bark, and that the preparation as usually met with contains only a very small proportion of quinine or other alkaloid. The decoction and infusion, though unsatisfactory preparations themselves, are decidedly superior to the liquid extract.

Extract of Malt. T. T. Goodale. (Abstract of a thesis presented to the Massachusetts College of Pharmacy. From *New Remedies*.) In preparing extract of malt, cleanliness is of primary importance. The vessels should be thoroughly washed in some alkaline solutions, such as solution of soda or potash, to prevent any substance from adhering to them, and when not in use should be filled with lime water. If these precautions are neglected, acetification is sure to follow, and the preparation is spoiled. Care must also be taken that the malt be fresh, as it sours and becomes unfit

for use if it has been crushed more than three or four days. The grain must be reduced to a moderately fine state, and the best mode is that which crushes it and loosens the husk from the fleshy part without separating the two. Each shell then forms a filter through which the clear liquid percolates, leaving behind any matter which might be mechanically taken up. When ground in a mill, the grain is so disintegrated that it is apt to set during the process of extraction, and form a mucilaginous magma which retains much of the liquor. This cannot be removed except by repeated washings; a very dilute extract is then produced, which is liable to acetification in the succeeding treatment. In order to obtain a concentrated and bright liquor, the saccharine and amylaceous matters must be extracted with the smallest amount of water, and maintained at a proper degree of heat. The grain will be completely exhausted by one mashing, if successfully conducted. Failure may result from two causes: when a mucilaginous mass is formed in consequence of too elevated a temperature, or when the grain is too fine, the liquor cannot be drawn off freely, and the grain is, therefore, not thoroughly exhausted. If, on the other hand, the temperature is too low, the starch is not converted into dextrin and glucose, but is carried off in suspension. The washing apparatus which was found most convenient consists of a tube similar to that used by brewers, smaller at the bottom than at the top, with a finely perforated bottom fitted to it. In the side, between the true and false bottoms, is placed a tap. Fitting into the perforated bottom, and passing through the cover, is a mixer, which is an upright shaft having crossbars attached running at right angles to it. A cog-wheel fitted to the top of the shaft, together with a crank, communicates power to it. A cover made of heavy felting was adjusted to the tub. Wood and felt being both non-conductors, any desired temperature can be constantly and perfectly maintained for many hours. Care must be taken to keep the heat of the mash at 160° F., the conversion of starch into dextrin and glucose being best effected at that degree. The freshness, hardness, and dryness of the grain exert an influence on the temperature. When very dry, heat is generated, and the conversion of the starch causes a still greater elevation of the temperature. Boiling water is poured into the tub, and when the heat has fallen to 165° F., the malt is gradually added and thoroughly stirred in. The temperature is now brought to 160° F., and the tub is closely covered to maintain the heat. After stirring a short time, the mash is allowed to remain at rest for two hours. At the end of this time, the tap is care-

fully turned until it is half open. The liquid which flows out should be perfectly bright and clear, and great care should be used to prevent fine particles of grain or any solid matter from passing out. After drawing all the liquid from the tub, a fresh quantity of water, heated at 160° F. is sprinkled on the grain, allowed to remain about an hour, and then drawn off as before. If the grain is not exhausted, this operation must be repeated, but nothing of value will remain after two macerations if they have been properly conducted. When three macerations are necessary, the resulting liquor is so dilute that acetification is apt to take place before it is evaporated. In practice, in order to obtain at once a very concentrated extract, which should contain all the valuable properties of the grain, the liquid obtained from the first washing is returned to the tub and drawn off in an hour. It is then only necessary to sprinkle on sufficient hot water to force out the liquor held by the grain. If the process has been successful, the extract will be the exact colour of the grain used, will have a good head, be finely flavoured, and effervesce. When the temperature has been too high, the white head has a tinge of brown, and the colour of the extract deepens in exact proportion to any excess of heat. If, on the contrary, the temperature has not been high enough, the liquor is less bright and pleasant in flavour. When the heat has been very low, the characteristic head will not stand, but flies off immediately, and the liquor will be thick and mucilaginous, and quickly spoil when exposed to the air. This process differs greatly from Mr. Ebert's, by which the malt is digested for a short time at a temperature of 125° F., and then strained. The liquor obtained contains the diastase. The residue is boiled with fresh water, and strained, and the resulting liquor contains the starch. The two solutions are then mixed and kept at a temperature of 160° F. until the starch is completely changed into grape-sugar, which can be readily ascertained by the iodine test. If a higher degree of heat is used, the diastase of the grain is coagulated, and becomes insoluble and inactive. After straining and filtering, the liquor must be carefully evaporated to the proper consistence. The importance of having the liquor perfectly clear and bright was shown by a series of eight experiments as follows:—

Experiment No. 1.—The liquor was pale and not very bright. It was placed in a shallow vessel over a water-bath, and constantly stirred. The albuminous matter which made its appearance during the operation was removed, and the evaporation continued until an extract of the consistence of honey was obtained. It was light

brown in colour, with a sweet taste, and had the odour of malt. At the end of two weeks it showed no change, but in four weeks a thin crust had made its appearance. After eight weeks the mass had separated into two distinct layers. The upper one, or crust, which formed about one-third of the whole, was a shade lighter in colour than the original extract, and quite tough and pliable. It had a starchy appearance and taste, and, when tested with iodine, gave the blue reaction characteristic of starch. The lower layer was a trifle lighter and more liquid than the original extract, and had an agreeable sweet taste and odour. With iodine it gave negative results, showing the absence of starch. These layers were separated and again examined in four weeks. The crust had grown somewhat harder, but otherwise remained the same. The lower layer showed no change. The peculiar behaviour shown in this case was thought to be due to the separation of the solid and starchy matter of the grain, which had been held in suspension, but which separated when the liquor was evaporated.

Experiments Nos. 2, 3, and 4.—These three lots were made in the same manner as No. 1, except that particular care was taken to obtain the liquor perfectly clear and bright. The same process of concentration was strictly followed. When finished, all presented the same appearance, and exactly resembling the lower layer of No. 1, in colour, taste, and odour. At the end of eight weeks, all remained light brown clear extracts. The liquor used in all the preceding experiments was made in a mash-tub.

Experiments Nos. 5 and 6.—The liquor used in these experiments was made by Ebert's process. When first strained, it had a pale starchy appearance. Being shaken with paper-pulp and again strained, a perfectly clear, bright colour was obtained. The method of evaporation was precisely the same as in previous experiments, and the product resembled in every particular those resulting from Nos. 2, 3, and 4. Examination at the end of eight weeks showed no change.

Experiment No. 7.—The liquor used in this experiment was made by Ebert's process, but was merely strained, not brightened. At the end of eight weeks, the peculiar formation noted in No. 1 had made its appearance. After separation, the lower layer remained unchanged, and presented every characteristic of a good extract.

Samples from Nos. 2, 3, 4, 5, and 6 when tested for starch gave negative results.

These experiments, then, proved the correctness of the theory that the peculiar formation noticed when turbid liquors were used,

was due to the presence of the solid and starchy matters of the grain, which had passed out in suspension; and that no such formation will take place when the liquor is perfectly clear and bright. Filtering, which is necessary in Ebert's method, renders the process impracticable for large lots, as it is long and tedious.

When made in a mash-tub, the liquor is obtained at once perfectly bright and clear, and is ready to evaporate.

Having obtained a bright liquor, which is necessary, the next step was to find a process by which this liquor could be evaporated in considerable quantities at once, and, at the same time, be made to yield a preparation of a light and uniform colour. When evaporated in the ordinary manner in an open pan, good results can be obtained by constant stirring and careful regulation of the heat, provided the quantity of liquor is small. In making large lots, the long-continued heat necessary to reduce so much liquid produces an extract very dark in colour, and sometimes black. This process is, therefore, impracticable. The vacuum-pan presented itself as a ready solution of the problem, since by it a very bright, sweet extract can be made, which in taste, odour, and particularly in colour, is all that can be desired. This method, however, was abandoned, as the aim was to find some process which would not require complicated or expensive apparatus. The plan of evaporating in very shallow pans at a low temperature was then tried. The clear liquid was poured into tin pans $\frac{3}{4}$ of an inch in depth. These were then placed in a drying closet having a heat 80–90° F. The result was but little inferior to what was sought, namely, a sweet extract entirely free from any burnt appearance or taste, with an odour resembling fresh bread. The amount of room necessary to carry out this plan led to its abandonment. The fact that the exposure of a very large surface to the air greatly facilitates evaporation, then led to the adoption of an apparatus by which this advantage was secured, and a very low degree of heat could be employed. There being no ceiling to the room in which the experiment was conducted, two wooden uprights, 12 inches wide, which reached nearly to the bottom of a jacketed kettle underneath, were fastened to adjacent floor-beams above. A wooden roller passed from one upright to the other near the bottom, while near the top two rollers were placed parallel to each other. Over these rollers a band of cloth was passed, forming, as it were, a letter V closed at the top. Power was communicated by means of a crank attached to one of the upper rollers. The kettle being filled with the clear liquor, steam was turned on until the temperature reached 80–90° F.,

and the heat was kept at this point until the operation was finished, The belt was now set in motion, and passing through the liquor, brought the warmer portions to the surface, and carried a considerable part with it as it passed over the rollers. By this method a large quantity of liquor can be quickly reduced to a small bulk by a low heat and with little labour. The rapidity of the evaporation is increased by directing a current of air upon the band, and is also, of course, somewhat in proportion to the length of the band and the amount of surface thus exposed. This process yielded a very satisfactory product, very light in colour, and free from any burnt taste. When compared with lots made in the ordinary manner, its superiority was very marked. Here, then, was a method which gave good results, required only just sufficient heat to warm the liquor, and was easy in manipulation, while the apparatus was inexpensive and occupied but little room.

A freezing process next presented itself as possessing two great advantages: namely, the entire absence of heat during concentration, which would render the formation of caramel impossible, and the great preservative power of cold. The operation was conducted as follows:—The clear liquid, when cold, was frozen in an ordinary ice-cream freezer. The ice-cake was then broken, placed in a strong canvas bag, and firmly pressed in a tincture press. The ice-cake remaining in the press was of a pale straw colour. The liquid expressed was again frozen and pressed, and the process continued until a thick syrupy liquid was obtained. This was placed in shallow pans in a warm drying closet, and in about an hour was of the proper consistence. The finished extract was of very superior appearance, but the yield was less than in previous experiments, the ice-cake retaining some of the liquor. In subsequent experiments, the ice-cake was divided into several portions; these were put into several bags, and iron plates placed between them. All were then pressed until the liquor ran white. The ice-cake remaining should be colourless. The liquor was again frozen and again pressed in the same way, until the product could no longer be frozen; it was then finished in the drying closet as before. The yield was now satisfactory.

Of the two methods of concentration, each possesses its own special advantages. The first, in which a large evaporating surface is obtained by means of a belt of cloth, recommends itself by the simplicity of the apparatus and its economy in time and labour, while the finished product is of good appearance. The readiness with which this method may be employed in every store

will probably render it the most useful. The second, or freezing process, has the advantage of giving an exceptionally superior product, free from all colour except that obtained from the grain.

To sum up: in order to prepare a good malt extract, the best malt must be used; a uniform and proper temperature must be maintained during the washing process; care must be used in drawing off the liquor, to prevent the solid matter of the grain from passing out; the exhaustion of the grain must be accomplished with as little water as possible, and the concentration must be effected rapidly at a low heat. By careful attention to these details, an extract of good appearance will be obtained containing all the valuable properties of the grain.

Pharmaceutical Preparations of Corn Silk. G. W. Kennedy. (*Amer. Journ. Pharm.*, May, 1883.) The author recommends the following formula:—

Tincture of Corn Silk.

Corn Silk, Green	24 parts.
Diluted Alcohol, sufficient to make	100 „

Cut the silk into small pieces, either with a large pair of scissors or a tobacco cutter; after which, place in a mortar and beat into a pulp with a small quantity of the diluted alcohol. Prepare a cylindrical glass percolator, by closing the lower orifice with a cork; transfer the silk pulp to the percolator, and add sufficient of the menstruum to form a layer over the pulp; cover the percolator closely, and allow to macerate for forty-eight hours; then loosen the cork enough to permit percolation to proceed at the rate of 40 drops per minute; add enough diluted alcohol and continue the percolation until 100 parts are obtained. The tincture possesses the characteristic odour of corn silk, is of a yellow-straw colour, and of a pleasant, sweetish taste. Dose for an adult, 1 or 2 fluid drachms (gm. 4 to 8).

Fluid Extract of Corn Silk.

Corn Silk, Green	200 grams.
Glycerin	20 „
Diluted Alcohol, sufficient to make	100 c.c.

Cut the silk into small pieces. Mix the glycerin with 80 grams of diluted alcohol. Place the cut corn silk into a mortar, and beat into a pulp with a portion of the menstruum; after which, pack in a cylindrical glass percolator; add sufficient of the mixture to cover

the pulpy mass, and when the liquid commences to drop from the percolator close the lower orifice; cover the percolator tightly, and allow to macerate for forty-eight hours; then permit percolation to go on slowly, about 40 drops per minute; add the remainder of the glycerin mixture, and then diluted alcohol until the drug is exhausted, reserving the first 70 c.c. of the percolate; evaporate the remainder to 30 c.c., and mix with the reserved portion, making in all 100 c.c. The odour and taste is similar to that of the tincture, but much stronger, and the colour is a shade or two darker. Dose for an adult, from $\frac{1}{2}$ to 1 fluid drachm (2 to 4 grams).

Syrup of Corn Silk.

Fluid Extract of Corn Silk	. . .	12 parts.
Syrup.	. . . . .	88 „

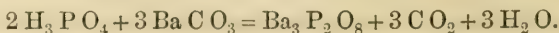
Dose, from 1 to 2 fluid drachms (4 to 8 grams).

New Process for the Preparation of Syrupus Ferri Phosphatis.
D. Gorrie. (From a paper read before the North British Branch of the Pharmaceutical Society, and printed in the *Pharm. Journ.*, 3rd series, xiii. 501.) The method described has for its main feature the constant retention of the iron in solution, and the saving of the trouble of precipitating, washing, draining, drying, and redissolving a ferrous compound which is very prone to oxidation. The formula is as follows:—

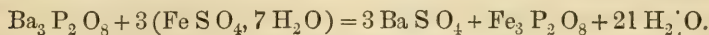
Granulated Sulphate of Iron	. . .	224 grs.
Syrupy Phosphoric Acid (sp. gr. 1·500),		
9 drachms by weight	. . .	56 grs.
Pure Carbonate of Baryta	. . .	159 grs.
Distilled Water	. . . . .	6 ozs. or q. s.
Refined Sugar	. . . . .	8 ozs.

Mix the phosphoric acid with three ounces of water, and in the mixture dissolve the sulphate of iron with the aid of heat; add the carbonate of baryta, and, when effervescence has ceased, continue the heat for a few minutes, to allow the precipitate to aggregate; then allow to cool. Filter when cold, and wash the precipitate with 3 ounces of cold distilled water; in the filtrate dissolve the sugar, without heat, and make up to 12 ounces if necessary.

In the first instance, the carbonate of baryta will react with phosphoric acid to form baryta phosphate, carbonic acid, and water, thus,—



Double decomposition will then take place between the iron sulphate and baryta phosphate, thus,—



Syrup of Tolu. M. Malenfant. (*Journ. de Pharm.* [5], vi. 466). The benzene-like odour which this syrup develops some time after it is made is attributed by the author to the decomposition of the ethereal cinnamates present, these yielding first cinnamic acid, which is then further decomposed into cinnamene and carbonic anhydride. Cinnamic acid when boiled, either with distilled or with ordinary water, for several hours, shows no sign of decomposition; but if left at rest for a month or six weeks, it acquires the persistent odour above referred to. If, however, the acid is simply left in contact with cold water for the same time, without previous boiling, no alteration takes place.

The Preservation of Syrup of Iodide of Iron. C. van Wiselingh. (*New Remedies*, May, 1883.) Some time ago J. de Groot published a paper in the *Pharmaceutisch Weekblad* (Sept. 17, 1882), in which he states that syrup of iodide of iron which had been kept in an open burette, in which it was protected from contact with air by a layer of oil, was found to have lost 3 per cent. of its ferrous iodide. This statement induced the author of the present paper to re-examine the subject.

His results show that De Groot's statements cannot be correct. The latter states that he found a diminution of 2.941 per cent. of ferrous iodide in a syrup standing two months. The author could not detect any diminution of the percentage even after four months, and only noticed the syrup becoming somewhat lighter in colour, while the oils took up only a minute trace of iodine.

Deodorized Tincture of Opium. R. Rother. (*Amer. Journ. of Pharm.*, Feb., 1883.) It was found that opium contained a perturbing body, at one time supposed to be alkaloidal, but now presumed to be of a resinous nature. In order to avoid this substance in certain of its preparations, opium or its aqueous extraction was treated with ether, having in view the removal of this noxious impediment. Such a preparation is the so-called deodorized tincture of opium. The fact has been, however, ascertained, that aqueous treatment alone, by excluding the resinous matter, yielded a deodorized and otherwise analogous product, showing that the washing of the watery extract with ether is superfluous and wasteful. In order to prevent the possible solution of the resinous matter during the extraction of opium, and incidentally avoid the

unnecessary ethereal treatment, but especially circumvent the decidedly objectionable and ultimate application of heat needed in the extensive evaporation, the author changed the operation accordingly. Most volatile oils, resins, and semi-resins are soluble in fixed oily menstrua, aside from their various special solvents. Hence, the author concluded that, should there be a tendency in any of the opium resins or odorous principles to pass into aqueous solution, the presence of a fixed oily substance would be likely to prevent it. Vaseline was added to the heated mixture of opium and water, but since the vaselin did not promptly solidify in the cooling mixture, spermaceti was further incorporated with desirable effect. The mixed decantates filtered clear and rapidly; and as no evaporation was necessary, the tincture could be completed at once by the admixture of the requisite measure of alcohol. This result, in connection with the speed and facility of the operation, and comparative cheapness of the product, encourages the suggestion to abandon the ordinary tincture of opium altogether. Should it be advisable to retain the narcotine remaining in the dregs, a small proportion of dilute sulphuric acid might be used to secure it in the tincture as soluble narcotium sulphate. From these results the following formula for a deodorized tincture of opium is deduced:—

Opium, dried and powdered	2½ troy ounces.
Vaseline,	
Spermaceti	āā 1 troy ounce.
Alcohol	7 fluid ounces.
Water	sufficient.

Upon the opium contained in a suitable capsule pour 12 to 14 fluid ounces of water, and boil the mixture ten to fifteen minutes; then add the spermaceti and vaselin, stir them well together, let the mixture cool, and decant the liquid from the dregs. Upon the residue pour 8 fluid ounces of water, again heat the mixture, stir it well, and, after cooling, decant as before. Repeat this operation once more with 8 fluid ounces of water, or sufficient to make the mixed decantates, let the mixture become cold, filter, and finally add the alcohol.

Tincture of Nux Vomica. R. Rother. (*Amer. Journ. Pharm.*, Jan., 1883.) The author recommends the use of a solution of common salt along with the spirit for securing a complete extraction of nux vomica, on the ground that the salt readily softens and permeates the horny matter, and that probably a double decomposition occurs between the sodium chloride and the igasurates of the alkaloids of the drug. He suggests the following formula,—

Nux Vomica, in fine powder	8 troy ounces.
Sodium Chloride	6 drachms.
Alcohol,	
Water	āā, 1½ pint.

Dissolve the sodium chloride in the water; then add the alcohol, and mix them. Upon 2 troy ounces of the nux vomica, contained in a large capsule, pour 2 fluid ounces of the menstruum, and mix them by means of a pestle; then gradually add the remainder of the nux vomica, and thoroughly mix the whole as before. Pack this mixture very firmly into a cylindrical glass percolator, and pour on of the menstruum, little by little, until, in the course of six to eight hours, the liquid has descended to the bottom of the column. Now suspend the operation, and after twelve hours pour on more of the menstruum, and regulate the flow at the exit so that after twenty-four hours two pints of percolate may be obtained. To avoid a trace of turbidity, which is liable to appear in the first fluid ounce of percolate when the menstruum is added too rapidly at first, 1½ drachm of the solid chloride may be mixed with the nux vomica before packing, and the remainder dissolved as before. The finished tincture contains ¼ grain of sodium chloride in 15 minims.

Tincture of Iodine. J. Casthelaz. (*Journ. de Pharm.* [5], v. 498, 499.) The author takes advantage of the oxidation of hydriodic acid by potassium iodate to counteract the reduction which takes place when tincture of iodine is kept.

To every 130 grams of tincture of iodine of the Codex (120 grams of alcohol, 90° and 10 of iodine), 1 gram of potassium iodate is added, which is capable of reducing 3·58 grams of hydriodic acid with the formation of 3·56 grams of iodine, or more than one-third of the total iodine present. The proportion of iodine is thus always kept constant. The maximum quantity of potassium iodide which can be formed, 0·59 per cent., is so small as not to interfere with the action of the tincture, and therefore may be neglected. Potassium periodate may be substituted for potassium iodate.

Note on Tinctura Camphoræ Composita. J. Bland. (*Pharm. Journ.*, 3rd series, xiii. 363.) Finding that the greater portion of the oil of anise used in the preparation of this tincture remains undissolved,—a difficulty not experienced before the issue of the first British Pharmacopœia,—the author investigated the cause of this difficulty, and traced it to the fact that nearly the whole of the oil of anise now sold is the produce of *Illicium anisatum*, and is comparatively insoluble in proof spirit; whereas the oil of *Pimpinella*

anisum, which formerly was the only kind recognised, is freely soluble in that menstruum.

The Assay of Spiritus Ætheris Nitrosi. Prof. J. F. Eykman. (Abstracted from the author's pamphlet.) A critical examination of some of the principal methods of assaying this preparation leads the author to the conclusion that both Hoffmann's and Rosenbladt's processes are objectionable on account of the interference of the oxidation products of alcohol. His own method is free from this objection, and consists in the determination of the volume of nitric oxide, which is produced by decomposing ethyl nitrite by a ferrous salt, and is driven over and collected by distillation in an atmosphere free from oxygen. Full details of the process, as well as a wood-cut illustration of the apparatus used, will be found in the copious abstract published in the *New Remedies*, May, 1882, or in the reprint of the same in the *Pharmaceutical Journal*, 3rd series, xiii. pp. 63-66.

The following table represents a selection of analyses of spirit of nitrous ether by the author's process :—

Prepared according to Pharmacopœia.	Sp. Gr.	When shaken with 2 vols. sol. of CaCl_2 , there is separated	Result of Analysis upon 5 c.c.	Per cent. of Pure Ether.
1. Netherl. (fresh)	0·845	Nothing	20·2 c.c. NO at 8° and 769 mm.	1·56
2. Netherl. (fresh)	0·844	Nothing	26·4 c.c. NO at 9° and 769 mm.	2·04
3. Netherl. (fresh)	0·851	Nothing	32·0 c.c. NO at 10° and 769 mm.	2·44
4. Netherl. (old)	0·856	Nothing	4·9 c.c. NO at 8° and 769 mm.	0·37
5. U. S. (fresh)	0·837	—	41·2 c.c. NO at 8° and 769 mm.	3·22
6. U. S. (fresh) }	0·838	Nothing	24·4 c.c. NO at 6·5° and 769 mm.	1·92
7. U. S. (old)			24·6 c.c. NO at 6·5° and 769 mm.	
8. British (fresh)	0·845	p.c. p.c. 2=10 ether	38·1 c.c. NO at 6° and 769 mm.	2·94
9. ?	0·855	4=12 „	44·9 c.c. NO at 9° and 765 mm.	3·4
10. ?	0·856	12=20 „	48·2 c.c. NO at 6° and 771 mm.	6·2

The ether which is separated from the spirit by shaking with two volumes of a saturated solution of chloride of calcium consists only

in part of ethyl nitrite. From about 50 c.c. of the latter separated by calcium chloride, the author succeeded in extracting a few c.c. of pure acetic ether and a little ether. The liquid had not entirely distilled over when it had reached the boiling point of alcohol; the largest part distilled at above 25° C., and only a few c.c. could be collected at a temperature of 18° C.

Aromatic Spirit of Ammonia. Dr. J. C. Thresh. (From a paper read before the Pharmaceutical Society, Feb. 7th, 1883, and printed in the *Pharm. Journ.*, 3rd series, xiii. 661.) The B. P. "spirit ammoniæ aromaticus" differs from that of other pharmacopœias in being prepared entirely by distillation. It would appear as if the compilers of the Pharmacopœia had intended the finished product to contain 8 per cent. of normal ammonium carbonate, and no free ammonia; but, inasmuch as it contains 67·7 per cent. of absolute alcohol, 4 per cent. of ammonium carbonate is the maximum amount it can hold in solution; and to obtain it of this strength it is necessary to operate on small quantities, and observe a number of precautions during the distillation; the remainder of the ammonia is then found dissolved in the free state, the carbonic acid corresponding thereto having escaped. A very considerable experience in the manufacture of this article in quantities of from 1 to 4 gallons has led the author to form the following conclusions:—

1. That the product varies considerably in strength and in relative proportions of ammonia and ammonium carbonate; this variation depending upon the quantity of material operated upon, the rapidity with which the distillation is conducted, and probably upon other factors.

2. That the larger the quantity of spirit distilled the poorer is the product in carbonic acid.

3. That working with the B. P. quantities in *warm weather*, and employing every precaution to prevent loss of ammonia, and to transfer all the carbonate deposited in the condenser into the distillate, the product will contain 4 per cent. Am_2CO_3 , and 1·42 per cent. NH_3 .

4. That in cold weather the solution thus made deposits crystals of the ammonium carbonate. If made in winter, the whole of the salt condensed in the warm does not dissolve when shaken with the distillate, unless the latter is heated. Of course, upon cooling, the excess again separates.

5. That in the B. P. process from 1·4–1·6 per cent. of the spirit remains behind in the still. To obtain all the alcohol, at least $7\frac{1}{2}$ pints must be distilled.

These conclusions are fully substantiated by the results obtained upon the analysis of samples from the first pharmacies, and from manufacturers of the highest repute; which results were communicated to the Pharmaceutical Conference in 1880. With regard to appearance, aroma, and keeping qualities, our "spiritus ammoniæ aromaticus" leaves nothing to be desired, but in the more important matter of constancy in strength, it is anything but satisfactory.

The formula which appears to the author the most likely to supersede the present one is as follows:—

Take of—

Oil of Lemons	.	.	.	.	.	5viss.
Oil of Nutmeg	.	.	.	.	.	5ivss.
Rectified Spirit	.	.	.	.	.	Ovj.
Water	.	.	.	.	.	Ovij.

Distil 7 pints, set this apart; then continue the distillation until 9 ounces more have been collected.

Take of—

Ammonium Carbonate	.	.	.	.	4 ozs.
Stronger Solution of Ammonia	.	.	.	.	8 "
The last portion of above distillate	.	.	.	.	9 "

Place in a bottle holding a little more than 1 pint, cork securely, and place the bottle in a water-bath at about 140° F., shaking from time to time until all the salt has dissolved. When cold, filter if necessary through a little wool, and pour into it gradually the seven pints of distilled spirit.

The product will measure 1 gallon; its specific gravity is .886, and it contains 3.45 per cent. of normal ammonium carbonate, and 1.23 per cent. of free ammonia. Whilst not quite so strong as it is possible to make a spirit of ammonia by the official process, it is considerably above the average strength of the sal volatiles of commerce. From the more dilute character of the spirit, none of the carbonate is thrown out of solution even at 0° C., and by the continuing the distillation a little beyond the point now ordered (in the B. P.), the whole of the alcohol is contained in the finished product, instead of a portion being wasted as heretofore.

One fluid ounce requires for neutralization 558 gr. measures of the volumetric solution of oxalic acid, and the same quantity after the addition of 330 grain measures of solution of barium chloride (1 in 10) should yield, when filtered, a further precipitate when more of the reagent is added.

For comparison, the results obtained by analysis of a sample of sp. am. co., made by the method here recommended, are given, together with the mean of the results obtained from nineteen B. P. samples examined in 1880 :—

	Free NH ₃ per cent.	Am ₂ CO ₃ per cent.	Total NH ₃ per cent.
New Process	1.25	3.53	2.49
B. P. Process (mean of nineteen samples)	1.33	1.88	1.99

Note on Essence of Ginger. Dr. C. Symes. (*Pharm. Journ.*, 3rd series, xiii. 819.) The author's experiments were made with green ginger obtained from Rio Janeiro. A sample of this was freed from the epidermis, and surface-dried by exposure to the air for a few hours. It was then cut in thin slices and macerated for some days with an equal weight of rectified spirit, which, when filtered, yielded an essence possessing a very fine aroma, and forming an almost perfectly clear solution in water. It was fairly strong, and could have been prepared stronger still by carrying the drying of the ginger a little further. The author thinks, however, that the solubility would diminish if the drying were completed, and the result would therefore cease to be a soluble essence.

New Methods of Preparing Phosphorus Pills. H. H. Millhouse. (*Pharm. Journ.*, 3rd series, xiii. 923.) The author calls attention to the two following formulæ for the preparation of these pills, as affording a satisfactory basis for the administration of phosphorus.

No. 1.

Phosphorus	5 grains.
Benzoated Lard	250 „
Phosphate of Calcium	205 „
Carbonate of Calcium	20 „

Melt the lard by means of a water-bath; transfer to a strong stoppered and perfectly dry glass bottle, made warm; add the phosphorus, shake until dissolved; then pour the solution upon the powders, previously well mixed and contained in a similar stoppered bottle, kept warm by standing in hot water, shaking briskly until the mass is thoroughly uniform in consistence. Each 3-grain pill contains $\frac{1}{32}$ nd of a grain of phosphorus in the free state.

No. 2.

Phosphorus	4 grains.
Powdered Mastich	30 „
Paraffin Wax	50 „
Vaseline	66 „
Kaolin.	90 „

Melt the wax and vaseline together in a porcelain capsule by the heat of a water-bath; place them in a strong glass-stoppered bottle, previously warmed by allowing it to stand in an oven or other warm place; add the phosphorus (care being taken that the mixture is not too hot, a temperature of 140° F. being quite sufficient to fuse the phosphorus), and shake briskly until cool; when quite cold, rub carefully in a mortar with the kaolin and powdered mastich, previously well mixed, until a uniform mass is obtained. It should be kept in a covered pot.

The vaseline used in the foregoing formulæ was kept in an evaporating dish at a temperature a little above its melting point for twelve hours, in order to dissipate all trace of moisture.

Both are easily prepared, and if ordinary care is exerted, the danger of oxidation of the phosphorus is reduced to a minimum.

Before coating with French chalk (pearl coating), these pills should be varnished with an absolute alcoholic solution of sandarac, or other suitable alcoholic solution, ether partially dissolving the bases employed in their preparation.

Phosphorus Pills. A. Robbins. (*Proc. Penn. Pharm. Assoc.*, 1882.) The author recommends the following formula as superior to those in use:—

Phosphorus	1 grain.
Chloroform	1 fl. drachm.
Balsam of Tolu	30 grains.
Wheat Flour	70 „

Rub the tolu with the flour until it is reduced to a fine powder; put the chloroform into a test tube; add the phosphorus, and warm the tube until it is dissolved; pour the solution on the contents of the mortar; rub until a pilular mass is obtained, which divide into one hundred pills.

The pills may advantageously be coated with gelatin by either of the following methods:—

The first is a modification of a formula published in the *American Journal of Pharmacy*, 1879, p. 435. It possesses the advantage of being always ready; but the coated pills are rather slow in drying.

The second requires to be heated when used, and needs the occasional addition of water; but when a considerable number of pills are to be coated, it is much to be preferred to the other, as the pills can be removed from the needles in a few minutes, and another lot put on and coated.

No. 1.

Gelatin	3j.
Acetic Acid	5xx.
Spirit of Nitrous Ether	f 3xii.
Oil of Gaultheria	mx.

Dissolve the gelatin in the acetic acid with the aid of a water-bath, then add the other ingredients, and mix. To be used cold.

No. 2.

Gelatin	3j.
Sugar	3ss.
Water	f 3ij.

Dissolve with the aid of a water-bath, and use while hot, adding a little water occasionally to make up for the loss by evaporation.

Note on Unguentum Hydrargyri Nitratis. H. C. C. Maisch. (*Amer. Journ. Pharm.*, 1883, 232.) The ointment was prepared according to the formula published in the *American Journal of Pharmacy*, 1883, p. 145. The lard and neat's foot oil were heated together until the thermometer registered between 150° and 160° F. when the lamp was removed, but the temperature continued to rise until the mercury stood between 190° and 200° F. When the mixed fats had cooled down to 170°, the camphor was dissolved therein, and soon after the mercury, previously dissolved in the nitric acid, was added, no effervescence being observed. The mixture was then stirred with a horn spatula while cooling, yielding an ointment of a yellow colour, which in two days darkened considerably, even without bringing it in contact with an iron spatula. A portion of this ointment was stirred with an iron spatula, when it became rapidly dark coloured.

To be certain whether or not the previous heating of the fats had any effect on the ointment, another quantity of the ointment was made, the melted fats being kept in a water-bath at a temperature not exceeding 170° F. After the addition of the camphor, followed by that of the solution of mercury in the nitric acid, a slight effervescence was observed. A portion of this ointment, worked with an iron spatula, was affected in a similar manner as in the preceding

experiment, while that portion in the preparation of which a horn spatula was used retained its yellow colour.

Carlsbad Salts. E. Harnack. (*Chem. Centr.* [3], xiii. 670, 671.) The preparation of the so-called "Sprudelsalz" has been conducted very imperfectly, the usual preparation being, in fact, principally crystalline Glauber salts. This state of things is now being improved, and the process employed is this:—The spring water is boiled, and the precipitate (iron, manganese, calcium, magnesium, and silica) filtered off; the filtrate is evaporated, and saturated with carbonic anhydride from the spring, to reconvert the carbonate into bicarbonates. The salts then have the following constitution, nearly approaching the natural proportions:—

	Per cent.
Sodium Bicarbonate . . .	35·95
Lithium Bicarbonate . . .	0·39
Sodium Sulphate . . .	42·03
Potassium Sulphate . . .	3·25
Sodium Chloride . . .	18·16
Sodium Fluoride . . .	0·09
Sodium Borate . . .	0·07
Silica . . .	0·03
Ferric Oxide . . .	0·01

A litre of the water yields $5\frac{1}{2}$ grams of salts; they form a pure white very fine powder, containing very little moisture and no water of crystallization. It is very soluble in water; a heaped-up table-spoon (about $5\frac{1}{2}$ grams) dissolved in a wine bottle (litre) of water, gives approximately the concentration of Carlsbad-spring water.

The author recommends the following proportions for the artificial preparation of the salt, the other ingredients having no therapeutic value in his opinion:—

Sodium Bisulphate. . . .	100 parts.
Sodium Bicarbonate	80 „
Sodium Chloride	40 „

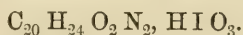
The German Pharmacopœia gives 44, 36, and 18 parts respectively of these ingredients, besides 2 parts potassium sulphate. Six grams of this mixture should be dissolved in one litre of water.

Quinine Iodate and Bromate. Dr. C. A. Cameron. (Abstract of a paper read before the Medical Society of the King and Queen's College of Physicians, and printed in the *Dublin Journal of Medical Science*, July, 1882.) Iodate of quinine is a salt which appears to have been scarcely studied. Only two references to its existence

are to be found in the books and journals relating to chemistry and pharmacy. Sérullas states (*Annales de Chimie et de Physique*, xlv. 282) that it may be prepared by dissolving quinine in a hot solution of iodic acid, and that on cooling the solution the salt crystallizes out in a form resembling sulphate of quinine. Sérullas does not appear to have analysed the salt. According to Pelletier and Caventon (*Annales de Chimie et de Physique*), both iodate and hydriodate of quinine are formed by digesting quinine and iodine by the aid of heat.

Quinine iodate may be prepared by digesting freshly precipitated and still moist quinine, with a warm solution of iodic acid, in the proportion of a molecule of each (the iodic acid should be dissolved in eight or ten parts of water). The resulting mass cannot be dried at the heat of the water-bath, as it causes some decomposition of the salt. Dried at a temperature of 60° F., and then placed *in vacuo* over sulphuric acid, it undergoes no further loss of weight. The salt has a white pearly appearance, and consists of extremely minute needle-shaped crystals, which contain no water. Boiling water does not decompose it. It is very slightly affected by strong sulphuric acid. Hydrochloric and dilute sulphuric acid dissolve it readily; it is not quite so soluble in acetic acid. Spirit of wine effects its solution readily, but in ether and chloroform it is sparingly soluble. Seven hundred parts of cold water dissolve one part of the iodate; in warm water it dissolves much more readily.

The mean of several determinations of the amount of iodine in the dried iodide of quinine gave 21·8 per cent. The salt has therefore the following formula :—



The theoretical amount of iodine for such a formula is 22·92, but the small deficiency in the salt was due to the presence of a little free quinine; the iodate was found to be faintly alkaline from this cause.

The granulated effervescing iodate of quinine is composed of a mixture of the pharmacopœia compound of sodium bicarbonate and citric and tartaric acids with the iodate. Each drachm of the compound contains 2 grains, or one dose, of the iodate.

The author has not made many examinations of the urine of persons under administration of quinine iodate. In the case of a patient of Dr. Elliott, who was using the iodate for about a fortnight, the urine contained so much free hydriodic acid or iodides that it gave a yellow precipitate with nitrate of lead. In another

case iodic and hydriodic acids were detected in the urine within half an hour after the iodate had been taken, but no trace of quinine could be found in it. In the urine of the same person, passed three hours later, quinine was found.

Bromate of Quinine ($C_{20}H_{24}N_2O_3, HBrO_3$).—The author can find no account of this salt in the chemical books or journals. It may be prepared by precipitating barium bromate by sulphate of quinine, or by neutralizing quinine with bromic acid. It occurs when air-dried in small asbestos-like masses, which, under the microscope, are seen to consist of very long needles.

Quinine bromate has the same constitution as the iodate of quinine, but is more soluble in water; namely, one part in 250. Warm water dissolves it freely. The dry salt may be heated on the water-bath without discoloration; but its solution, when evaporated to dryness, leaves a residue more or less decomposed. The salt dissolves readily in hydrochloric and dilute sulphuric acids, and in spirit of wine. Acetic acid acts less readily upon it. Touched with a drop of strong sulphuric acid, it detonates, emits a puff of dark smoke, and almost wholly disappears. On iodate of quinine sulphuric acid produces only a slight yellow coloration, which vanishes on the addition of water, the salt dissolving and forming a colourless solution.

The original paper is supplemented by the medical opinions of a number of physicians, who state that they have found the quinine, iodate, and bromate valuable remedial agents.

Dialysed Iron. Dr. C. Schacht. (From *Pharm. Zeitung*.) The author suggests the following process as more convenient than those previously proposed:—

Dilute 485 parts of solution of chloride of iron (sp. gr. 1.480–1.484) with 4.250 parts of distilled water, and pour the liquid, while stirring, into 580 parts of water of ammonia (sp. gr. 0.960) previously diluted with 2,500 parts of distilled water. Collect the precipitate upon a linen strainer, wash it completely, press it carefully, then add 60 parts of hydrochloric acid, and, after three days dilute it gradually with distilled water until it has the specific gravity 1.046 at 15° C. (59° F.) The product contains 5 per cent of ferric oxide. It should be clear, brown-red, odourless, and of a faintly astringent taste.

One part of it, diluted with 19 parts of distilled water, and treated with 1 drop of nitric acid and 5 drops of tenth-normal solution of nitrate of silver, should show no reaction for chlorine when observed by transmitted light. Five grams evaporated to dryness

should leave a residue of ferric oxide which, after ignition, weighs 0.25 gram.

The dialysed iron thus obtained is *entirely* identical with that obtained by dialysis.

If the percentage of iron is to be determined, the residue left on evaporation must be ignited. 4.1765 grams yielded 0.2085 gram of ferric oxide = 4.99 per cent.

Effects of Iron on Digestion. Dr. A. Düsterhoff. (*Centralb. für med. Wiss.*, Nov. 11, 1882. From *Practitioner*.) In an inaugural dissertation, published at Berlin, the author records the results of some experiments bearing on this subject. One gram of fibrin was added to 20 c.c. of artificial gastric juice, and during digestion equivalent quantities of various preparations of iron were also added. At the end of the process the undigested fibrin was dried and weighed, and the quantity of soluble syntonin in the solution was also estimated. The time of digestion was in one case three hours ten minutes, in another it was seven hours and a half. In the first series, 0.0614 gram of metallic iron was in each case added, in the form of pyrophosphate, perchloride, and protolactate respectively. In the second series, various other preparations were used, the amount of metallic iron being in each case equivalent to 0.0077 gram. Other experiments were made with white of egg; the amount of albumen precipitated by boiling after digestion being estimated. The outcome of the experiment is, that the organic salts of iron seriously hinder and check peptic digestion. Probably the hydrochloric acid of the gastric juice displaces the organic acids from the iron salts, and so is used up; while the free organic acids in the digestive fluids are far less powerful digestive agents than the hydrochloric acid. But this cannot be the only cause at work, for perchloride and phosphate also tend to hinder digestion. Even reduced iron has a similar effect, for it partially dissolves in the juices, forming chlorides. Its solubility, like that of the phosphate, is however not very great. Ferrous salts seem to interfere less with digestion than ferric salts.

Ferrated Albumen. G. Buchner. (*Archiv der Pharm.*, 1882, 417-425.) From the author's investigation on compounds of ferric chloride with albumen, the *American Journal of Pharmacy* abstracts the following:—

The amount of chloride in egg-albumen was determined by ignition with sodium carbonate and titration with nitrate of silver; 1.6 per cent. Cl was found. The chlorine of the compound was determined in the same manner, deducting the chlorine of the

albumen. The iron was estimated by ignition, dissolving in hydrochloric acid, reduction to ferrous salt by zinc, and titration by potassium permanganate.

1. Solution of ferric chloride (1:20) was added to a filtered solution of albumen (1:10) until the voluminous yellowish brown precipitate was just dissolved. In the clear red-brown liquid, albumen, as well as ferric chloride, responded to the usual reagents. On evaporating this liquid at a temperature not exceeding 50°C ., and drying the gelatinous mass at the same temperature, a dark-brown powder or transparent brown-red scales were obtained, only partly soluble in water, the insoluble portion becoming transparent and gelatinous. Analysis: Fe, 2.193; Cl, 7.980; albumen, $89.827 = \text{Fe}_2\text{Cl}_6$, 6.354; excess of Cl, 3.819.

2. The preceding product was thoroughly washed with water and the residue dried at 50°C . Analysis: Fe, 1.488; Cl, 2.700; albumen, $95.812 = 4.119 \text{Fe}_2\text{Cl}_6$; excess of iron as $\text{Fe}_2(\text{OH})_6$, 0.131.

3. On slowly evaporating the original ferrated albumen solution the liquid becomes turbid, separating a thick jelly which is soluble in warm water, yielding a clear solution which is not precipitated by boiling. The jelly, well drained, pressed, and thoroughly dried over sulphuric acid, yielded Fe, 0.998; Cl, 4.531; albumen, $94.471 = \text{Fe}_2\text{Cl}_6$, 2.895; excess of Cl, 5.634. The powder was completely soluble in water, and the solution was not disturbed by boiling or by alkalies; acids caused a precipitate of albumen, while sodium chloride and potassium sulphocyanide precipitated ferrated albumen.

4. The original ferrated albumen solution was completely precipitated by a saturated solution of table salt; the precipitate was collected upon a filter, drained, pressed, the press cake rapidly washed by agitation with water and decantation, again pressed between bibulous paper, and dried over sulphuric acid. The powder swells with water, and dissolves after some time to a solution which is not disturbed by silver nitrate, but is precipitated by potassium sulphocyanide; its composition is Fe, 1.703; Cl, 1.680; albumen, $96.617 = \text{Fe}_2\text{Cl}_6$, 2.563; excess of iron as $\text{Fe}_2(\text{OH})_6$, 1.566.

5. The original solution of ferrated albumen was mixed with excess of ferric chloride and precipitated by table salt; treated as before, the powder contained Fe, 1.15; Cl, 1.78; albumen, $97.07 = \text{Fe}_2\text{Cl}_6$, 2.715; excess of iron as $\text{Fe}_2(\text{OH})_6$, 0.41. It behaved to reagents like the preceding. Both, if left in prolonged contact with water while being washed, become transparent, gelatinous, and then dissolve.

6. The original solution yields, with excess of ferric chloride, on

standing, a precipitate which, treated as before, gave a powder containing Fe, 1.25; Cl, 4.48; albumen, 94.27 = $\text{Fe}_2 \text{Cl}_6$, 3.627; excess of Cl, 2.103.

7. The original ferrated albumen solution was dialysed, the water being renewed until silver nitrate ceased to give a reaction. The contents of the dialyser had a neutral reaction, and could be readily filtered. The liquid was not disturbed by boiling, by alcohol, caustic alkalies, carbonic acid gas, or silver nitrate. It was coloured violet-blue by tannin, and green (without precipitate) by ammonium sulphhydrate. Nitric and hydrochloric acid caused a precipitate of albumen, the solution being yellow; lime-water a brownish yellow precipitate; potassium ferrocyanide a bluish green precipitate, turning dark-blue on the addition of hydrochloric acid; potassium ferridcyanide a green precipitate not altered by hydrochloric acid; potassium sulphocyanide a yellowish brown precipitate, the solution becoming deep red on the addition of hydrochloric acid; sodium chloride a light yellowish brown precipitate.

The liquid, evaporated at a moderate heat, yielded brown-red nearly tasteless scales, which retained their solubility in water, the solution on being kept for a year becoming slightly mouldy, but not putrid. The scales contained Fe, 1.1715; Cl, 0.510; albumen, 97.775 = $\text{Fe}_2 \text{Cl}_6$, 0.778; excess of iron as $\text{Fe}_2 (\text{OH})_6$, 2.765.

It is obvious from the foregoing that these products are readily altered, and cannot be of uniform composition unless obtained under precisely identical conditions of temperature, dilution, action of water, etc. It is remarkable that with the entrance of $\text{Fe}_2 (\text{OH})_6$ into the compound, these products become soluble in water and non-coagulable by heat, properties which, together with the peculiar behaviour to reagents, are best observed in the dialysed product, and result from a relatively small amount of iron. The difficulties of studying the nature of such products are increased by the uncertainty of determining the water without altering the composition, and of ascertaining whether definite compounds or mixtures of such are under investigation.

The formation of iron-albuminates may be used for proving the presence of albumen. A very diluted solution of albumen, which is scarcely rendered opalescent by boiling, if mixed with a saturated solution of table salt yields, on the addition of a little ferric chloride, near the point of contact a yellowish white zone; and on agitation, at first a dense turbidity, changing after a while to a rather voluminous precipitate.

On digesting iron in solution of albumen for a few days a

yellowish brown liquid is obtained, which on evaporation at a moderate heat yields light brownish red scales, similar in behaviour to the dialysed ferrated albumen; in two cases 1.2 and 2 per cent. of iron was obtained. Freshly precipitated ferric hydroxide dissolves in albumen; the dry product contained $0.65 \text{ Fe} = 1.24 \text{ Fe}_2(\text{OH})_6$. Ferrous hydroxide is very slightly soluble in albumen.

The Antiseptic Action of Carbolic Acid. G. Wolffhügel and G. v. Knorre. (*Chem. Centr.*, 1882, 367.) In his treatise on antiseptics, Koch observes that solutions of carbolic acid in oil are inferior to aqueous solutions in their disinfecting action. The authors have made it their object to ascertain the cause of this peculiarity. The action of a disinfectant cannot be regarded as perfect unless it enters into all the parts of the objects to be preserved, and penetrates into the micro-organisms adhering to and living in the same. As water has a greater power of increasing capillarity than oil, it penetrates with greater ease; oil in penetrating into substances containing water has to contend with obstacles. It is, however, possible that by bringing aqueous and oily solutions together, an interchange between the dissolved constituents takes place, inasmuch as they are soluble in both liquids. On investigation, it was found that the carbolic acid from carbolic oil is not given up to water as freely as that from carbolic water to oil, a circumstance which is explained by the greater solubility of carbolic acid in oil. To what extent this peculiarity of the oil and its inferiority in penetrating into porous solids and mixing with liquids, is attributable as the cause of the inactivity of carbolic acid in oily solutions, cannot be estimated, as it has not been determined how oil and water behave as regards giving up carbolic acid to micro-organisms. Oil should not be used as a solvent for carbolic acid in cases where it is desirable that the fungi adhering to or living within watery, solid, and liquid bodies, should be destroyed within twenty-four hours after treatment.

Disinfectants. R. Koch. (*Chem. Centr.*, 1882, 509-512; *Journ. Chem. Soc.*, 1883, 249.) The mode of action of individual disinfectants has not been sufficiently investigated, because of our incomplete knowledge of the infectious matter. An *efficient disinfectant* ought, in the author's opinion, to kill all living organisms and render all germs innocuous within twenty-four hours. To test a disinfectant thoroughly, its action must be tried on all disease-producing matter, and under conditions exactly similar to those in which it is used in practice. Thus, a disinfectant which does not kill fungi, would be of no use in contagious skin diseases, whilst

one which did not destroy bacteria would be inefficient in diseases caused by these organisms. The author has investigated the action of disinfectants on bacteria. In these experiments he has taken great care in the cultivation of bacteria, selecting those which are seldom found in the air. Experiments on the development of bacteria were made on solid nutritious substances. The chief points observed are:—1. If all the organisms are killed. For this it is sufficient to note the action on the most persistent, viz., the bacilli spores. 2. The facility with which the development of micro-organisms in favourable nutritive solutions is prevented.

Carbolic acid is almost without action on spores of *Anthrax bacilli*, e.g., the bacilli spores retained their vitality after being five days in a 2 per cent. solution, and in another experiment fifteen days in a 1 per cent. It is, however, destructive to the living micro-organism, for 1 gram of pure carbolic acid can completely prevent the development of *Anthrax bacilli* in 850 c.c. of a nutritive solution, and even shows a marked effect in 1250 grams. Its action on other bacteria is less marked. Carbolic acid in the form of vapour does not affect the germinating power of bacilli spores at the ordinary temperature, even after being in contact with them $1\frac{1}{2}$ months; but at 55° , in half an hour many of the spores are destroyed, in three hours scarcely any germinating power is discernible, whilst after five or six hours their destruction is complete. Raising the temperature does not increase the activity. Carbolic acid vapour can only be conveniently used for small objects.

The above results are obtained with aqueous solutions of carbolic acid. Solutions in oil or alcohol do not show any antiseptic properties; this is also the case with other disinfectants, e.g., salicylic acid, thymol, etc., except when they are used with substances containing water, such as flesh, etc., when some of the disinfectant becomes active.

Sulphurous acid, either alone or mixed with water or steam, does not disinfect dry objects. If, on the other hand, the object is first moistened with sulphurous acid and then treated, brisk action is observed; it does not, however, destroy all germs. Its disinfecting action is thus uncertain, and is not to be depended on.

Amongst many others, *zinc chloride* and *glycerol* are proved to be without effect. In fact the only *effective disinfectants* besides *chlorine*, *bromine*, and *iodine*, are *corrosive sublimate*, *osmic acid*, and *potassium permanganate*. The last-mentioned only acts in strong solutions (5 per cent.). Bromine and osmic acid are too expensive. Corrosive sublimate is very poisonous; its action, however, is so

very quick that it could be used for solid substances, which could then be washed well with water.

Substances effective in checking the germination of spores are corrosive sublimate, some essential oils, thymol, and amyl alcohol.

Disinfectants. F. Boillat. (*Journ. für prakt. Chem.* [2], xxv. 300. From *Amer. Journ. Pharm.*) In his article on disinfectants, Dr. R. Koch remarks that the only substances worthy of the name of disinfectants are chlorine, bromine, iodine, mercuric chloride, and perhaps potassium permanganate and osmic acid. He finds that spores of the bacillus of splenic fever, kept for many days in 5 per cent. zinc chloride solution, develop when placed in suitable nutritive liquids, even when added to serum containing $\frac{1}{2}$ per cent. zinc chloride. He wonders how this salt could ever have been regarded as an antiseptic.

Fr. Boillat, in criticising Koch's article, calls attention to the fact that for a substance to be an antiseptic it is not necessary for it actually to *destroy* germs. In the antiseptic treatment of wounds it would be impossible to employ such violently acting substances as those mentioned by Koch. All that is necessary is the presence of substances capable in some way of restraining the development of germs, which hence may properly be called antiseptics. Many antiseptics have the power of coagulating proteids. Boillat prepared such coagula from serum and egg albumen by precipitating with phenol, zinc chloride, copper sulphate, and mercuric chloride. These albuminates, after being well washed to remove any excess of the precipitant, were mixed with a little water and exposed to the air. Pure serum and Koch's gelatin served to control the experiments. In the serum, gelatin and phenolalbuminate, bacteria appeared in one, one, and two days respectively, and marked putrefaction in two, four, and six days respectively; while in the metal-albuminates bacteria did not appear until from thirty-one to forty-five days, and marked putrefaction in from forty-six to sixty days. The surprisingly rapid putrefaction of the phenol-albuminate was explained when it was found on examination to contain no phenol. Splenic fever spores were found to develop in gelatine in one day, and not at all in metal-albuminates. According to Boillat, Koch did not add enough zinc chloride to his serum to convert all the porteids into the harmless but innutritious zinc albuminate, and the spores availed themselves of the excess. Applied to the surface of a wound, zinc chloride forms a superficial coating of the neutral zinc-albuminate, which affords no means for the bacteria to develop, and protects the parts under it.

Experiments with iodoform (2 per cent. sol.)—carbon tetrachloride, C Cl_4 ; the chlorides, $\text{C}_2 \text{Cl}_4$ and $\text{C}_2 \text{Cl}_6$, and bromo-toluene (liquid and solid), and dimethyl-pyrogallol (1 per cent. sol. each)—as restraining putrefaction of pancreas, gave negative results, and paracresol was active only in solutions of at least $\frac{1}{2}$ per cent., and even then did not restrain the action of the pancreatic ferment.

Contributions to the Study of Antiseptics. F. Boillat. (*Journ. für. pract. Chem.* [2], xxv. 300-309; *Journ. Chem. Soc.*, 1882, 1243.)

Koch having declared in a recent paper that most of the substances at present employed as disinfectants are practically useless, and that the only ones worthy of the name are chlorine, bromine, iodine, and corrosive sublimate, with possibly potassium permanganate and osmic acid, the author undertook the investigations recorded in this paper; he thinks that this contradiction of generally accepted facts is not as strong as it appears. As the antiseptics employed in surgery do not require to be perfect, it is sufficient for the purpose of the surgeon, if the propagation of the organisms is arrested for a time long enough to allow the wound to heal. The spores by which some of the bacteria are propagated bear much analogy to the eggs of certain animals and the seeds of certain plants which preserve their vitality under very severe conditions, some of them not being killed even by weak acids. The classification of bacteria, according to their resistance to the action of antiseptics, has been commenced and carried to an advanced stage by Koch; the spores of the splenic fever organisms preserve their vitality for many days in a 1 per cent. aqueous solution of phenol, or a 5 per cent. solution of zinc chloride, but their development is arrested; this suffices for medical purposes, as although chlorine, etc., would effectually destroy them, they would also severely injure the patient to whose wounds they might be applied.

Most antiseptics form permanent insoluble compounds with albumen; for example, egg albumen, treated with a dilute solution of zinc sulphate or chloride, forms Lieberkühn's zinc albuminate, having the composition $\text{C}_{72} \text{H}_{113} \text{N}_{18} \text{S O}_{22} + \text{Zn O}_2 \text{H}_2$: similar reactions occur with the other substances named by Koch, and would also occur when applied to wounds.

Samples of blood serum and egg albumen, diluted with three or four times their weight of water, were precipitated with solutions of phenol, zinc chloride, copper sulphate, corrosive sublimate, etc., the precipitate thrown on a filter, washed until the wash-water was free from traces of the reagent, two or three grams of the damp substance was then beaten with water to a thin paste, and allowed

to remain at the ordinary temperature, loosely covered with a bell-glass; watch glasses containing serum and Koch's nutritive gelatin, without any additions, served to control the experiments, which were divided into three series—in the first the substances were left to the action of floating germs in the air. The control samples were infected in twenty-four hours, and became putrid in two to four days, but the other samples remained sound from six up to sixty days in the case of the mercury albuminate. In the second series the samples were sown with cocci, found on an infusion of coffee, and the third with splenic fever germs. In both of them the unprotected samples showed a remarkable increase of germs within the space of two days.

The albumen precipitated by phenol became putrid in forty-eight hours, the sample, on being distilled with water, showed no trace of phenol on adding bromine, the washing having removed it. This experiment was therefore a failure. Copper, zinc, and mercury albuminate remained for four weeks without perceptible change, and the author believes they would remain so for an unlimited period were oxygen and water absent.

Other experiments made with such materials as iodoform, carbon dichloride, tetrachloride, and hexachloride, solid and liquid bromotoluene, which have been favourably noticed in medical journals, were unsuccessful, and the author believes them useless as antiseptics.

On the Value of Sulphurous Acid as a Disinfectant. G. Wolffhügel. (*Chem. Central-Blatt.*, xiii. 334; *Journ. Soc. Chem. Ind.*, 1882, 335.) Sulphurous acid has, of late years, occupied a prominent place amongst disinfectants, since having been recommended by a committee of the German Empire for the cholera epidemic. Recently, however, its disinfecting power has been disputed. The Imperial Sanitary Board has, therefore, thought it necessary to submit this important matter to a renewed investigation. The necessary supply of sulphurous acid for disinfecting purposes is usually furnished by burning sulphur. This has, however, proved to be inefficient for several reasons. Sulphur is known not to burn very readily, and often to extinguish, and although this difficulty could be remedied by moistening it with spirit, the quantity of sulphurous acid evolved has been found to fall far short of the amount which might be produced with sufficient air-supply. This is due partly to deficient ventilation, partly to a loss of gas by escape. Thus, in tightly-closed sulphurizing chambers, a larger amount of sulphurous acid than 6·5 volume per cent. cannot be

obtained, and in a less perfectly closed space, and in rooms, only 40 per cent. of the available quantity of sulphur is converted into sulphurous gas. Experiments have been made to obtain information about the communication of the gas to the different parts of a room, and also on the subject of disinfection, with a view to find out whether, and to what extent the disinfectant penetrates into their interior. The method which was used for both purposes, and which has been made a special study by B. Proskawr, was the absorption or oxidation of the gas in a permanganate solution acidulated with hydrochloric acid and subsequent gravimetric determination. The application of sodium bicarbonate and titration with iodine solution has proved in all those experiments totally useless. It has thus been found that the gas in the experimenting rooms generally diffuses uniformly in all directions. Yet, in a few cases there were differences between the ceiling and the floor observed up to 3 volumes per cent. Also, the mortar of the walls had unequally absorbed some sulphurous acid. Moreover, the spreading of the gas over the objects of disinfection as well as the penetration into their interior was very uneven. Thin and very transmissible objects, such as letters, papers, clothes, permit the gas to enter copiously, but very little of it passes into the interior of voluminous and less permeable bodies, with a medium proportion of gas and the usual duration of the process. Thus, large commercial packages—as bales of goods and the like—cannot efficiently be sulphurized without loosening their covers and spreading out the contents. As this, however, cannot be practically carried out, sulphurous acid is not fit for the disinfection of packed goods. The same may be said with regard to dwellings and sick-rooms, as well as ships. Sulphurous acid has hitherto been believed to possess the power of destroying germs of infection without in the least integrating the carriers of them. After the observations now made this can no longer be admitted, as it has been proved that the moistening of the disinfecting objects, which seems necessary to bring about the effect, causes them, even in a less concentrated state of the sulphurous acid, to become injured, probably by assisting oxidation. Also, experiments have been made upon various forms of fungi and other low organisms, and they have shown that sulphurous acid is capable of destroying them rapidly, if they have not yet assumed the state of permanency, and if they are lying near enough the surface so as to be sufficiently exposed to the gas. But to such organisms as have once passed into a permanent condition, the sulphurous gas, even in a high degree of concentration, is

utterly harmless, provided they are dry. It is true that by moistening them all infectious matters become much more susceptible to the killing power of sulphurous gas. But the presence of water by no means affords absolute security, and it has been specially observed that spores arrived at the permanent state do not at all lose their capability of developing, if they are moistened and placed for twenty-four hours in a tightly-closed room, which contains no less than five volumes per cent. of sulphurous acid.

Effect of Various Antiseptics upon Morbific Germs. MM. Arloing, Cornevin, and Thomas. (From the *Lancet*.) The authors have published in the *Lyon Médicale* the results of a series of experiments on the influence of various disinfecting agents on the virus of symptomatic anthrax. If pulp from the tumours in this disease is allowed to dry slowly at a temperature of 35° C., a residue is obtained in which the organisms of anthrax retain their full activity. A few cubic centimetres of water, through which a little of the residue is diffused, has a virulence not inferior to that possessed by the fresh virus, and which continues for at least two years. The experiments on the influence of disinfectants were carried out with this dried virus, and also with perfectly fresh virus. It was found that the resisting power of the former is much greater than is that of the latter. Whatever destroys the dried is capable of destroying also the fresh virus, while the converse is not true. The different substances tested were left in contact with the virus for forty-eight hours, and the test of virulence was the hypodermic injection of five drops. The following substances were found to have no action even upon the fresh virus: alcohol saturated with camphor or with carbolic acid, glycerine, ammonia, acetate and sulphate of ammonia and sulphate of ammonium, benzine, a saturated solution of chloride of sodium, quicklime and lime water, polysulphide of calcium, a one-in-five solution of chloride of manganese, a one-in-five solution of sulphate of iron, a one-in-five solution of borate of soda, a one-in-five solution of tannic acid, a one-in-ten solution of sulphate of quinine, a one-half solution of hyposulphite of soda, essence of turpentine, and monobromide of camphor; of gases, ammonia, sulphurous acid, and chloroform. A saturated solution of oxalic acid, a one-in-twenty solution of permanganate of potash, a one-in-five solution of soda, vapour of chlorine and of sulphide of carbon destroyed the activity of the fresh virus, but had no effect on that which had been dried; while the activity of the latter was destroyed only by solutions of carbolic acid (2 per cent.), salicylic acid (1 in 1000), nitrate of silver (1 in

1000), sulphate of copper (1 in 5), boric acid (1 in 5), saturated salicylic alcohol, corrosive sublimate (1 in 5000), and bromine vapour.

Thus many substances unanimously regarded as antiseptics were without effect upon the virus, even in the fresh state. Pure or camphorated alcohol is largely used by surgeons in France to wash their instruments, but is evidently capable of giving only an illusory safety against morbid germs. Quicklime, in which it is often recommended that the bodies of animals dying of anthrax should be buried, and with which the walls of infected places are washed, is no better. At the moment of its hydration some organisms are probably destroyed by the heat which is disengaged, but those which are not in immediate contact with the lime seem to have preserved all their activity. Very thin layers of the tissue of the tumours of anthrax were taken and rolled up and plunged into the quicklime, and left in it for forty-eight hours. At the end of that time they were rubbed up with water, and the liquid was found to possess full virulence. The inutility of tannic acid suggests the question whether tanning is really adequate to destroy the poison in the hides of the affected animals, and it is clear that salting has no influence on the virus contained in the flesh, etc. Quinine, so powerful in the paludal diseases, which are now believed to be due to organisms, was found to have no influence over the bacteria of anthrax. Ammonia and its compounds were also powerless. Ammoniacal fermentation, therefore, which is said to destroy some bacteria, does not influence those of anthrax. Sulphate of iron and chloride of manganese, substances which have been strongly recommended as disinfectants, were equally powerless. Further, the sulphurous acid, which is so potent in action upon some parasites of high organization, and on many forms of virus, has no influence on the bacteria of symptomatic anthrax. Chlorine and sulphide of carbon, which destroy the fresh virus, are powerless against that which has been dried. Of all the vapours, bromine is the only one which seems to offer complete security. Another important result, from a surgical point of view, is the action of carbolic acid. A 2 per cent. aqueous solution destroys the activity of the dry virus, but all the power is lost if the carbolic acid is mixed with alcohol. This fact has already been noted by Koch with regard to other kinds of spores. On the other hand, salicylic acid mixed with alcohol preserves its power. Turpentine, recommended by Pasteur, for the purpose of destroying the bacillus of true anthrax, has no influence on that of symptomatic anthrax. At the head of the

efficient agents stand corrosive sublimate, of which a solution of 1 in 5000 is sufficient; next come in order nitrate of silver, salicylic acid, and carbolic acid. A 2 per cent. solution of the latter was found, however, only to destroy the organisms when it had been in contact with them for eight hours in the case of the fresh virus, and for twenty hours in the case of that which had been dried.

The practical deductions from these experiments are of the highest importance. So far as their use against symptomatic anthrax is concerned, the choice of agents to destroy the fresh virus in stables, etc., is a wide one. That for the dried virus, however, is more limited; only the bromine vapour can be regarded as affording complete security. For washing down places, the most efficient agent, corrosive sublimate, is rather dangerous. Solutions of sulphate of copper, carbolic acid (2 per cent.), or salicylic acid (0.1 per cent.) are recommended. For the effectual disinfection of carcasses, however, no agent should be trusted but combustion; but if this is impossible, it should be cut deeply and treated with corrosive sublimate, sulphate of copper, or carbolic acid.

Schizomycetic Fermentation. G. Marpmann. (*Pharm. Journ.*, 3rd series, xiii. 860.) In this paper the author has collected all the facts known concerning the various kinds of fermentation. Specific bacteria fermentation is that in which, by reason of the growth of bacteria, reduction products are formed, whilst oxidation processes by means of the same agents, such as nitrification, are not fermentation. Nencki explains the reducing action of bacteria by their power of decomposing water, one hydrogen-atom of which reduces, whilst the hydroxyl group is assimilated by the bacteria.

Glycerol.—Fitz describes three glycerol fermentations: (a) in the ethyl alcohol fermentation produced by a slender bacillus, probably identical with *B. subtilis*, in which neither butyric nor succinic acid, nor butyl alcohol is formed; neither can this bacillus decompose calcium lactate; (b) butyl alcohol alone is produced by a bacillus 0.005–6 mm. long by 0.002 mm. broad; (c) succinic acid is never formed by bacilli from glycerol, but Fitz found in blue pus a small micrococcus, which did act in this way. Schulze has found other bacteria, which besides forming ethyl and butyl alcohols, butyric and caproic acids, also produce a phorone of the composition $C_9H_{14}O$.

Tartaric Acid.—According to Gautier, Mediterranean wines under certain conditions rapidly become thick when exposed to the air; the red colour changes to a blue-violet, and a brown deposit is formed, as also acetic and lactic acids; the cause of this is a

bacillus of varying length, but 0.0012 mm. broad. König found succinic acid amongst the products of the fermentation of tartaric acid: hydrogen ammonium tartrate yields butyric acid and ethyl butyrate, under the influence of *Ascococcus Billrothii*.

Sugar.—The mass resembling frog spawn, into which beet juice is frequently converted, is due, according to Cienkowski and Von Tieghem, to *Ascococcus mesenteroides* (0.0018–0.002 mm. thick), whereby sugar is converted into cellulose. The lactic ferment of sugar consists of a thin scum, built up of cells 0.001–3 mm. broad, and nearly double as long. These cells are active only as long as oxygen is present: consequently the conversion is indirect. This ferment, described by Boutroux, does not produce succinic acid, but the acid is formed from grape-sugar by *Bacillus amylobacter*, fully described by Von Tieghem. *B. amylobacter* exists in the cells of all milky-juiced plants; a butyric fermentation of albumen is caused by *B. subtilis*.

Nitrogenous Matter.—Normal urine is decomposed by *Micrococcus ureæ* (0.00125–0.002 mm. broad), with formation of ammonium carbonate; pathological urine is affected by other bacteria. The most important fermentation of albuminous matter is occasioned by *Bacterium Termo* (0.0015–0.002 mm. long), and it is this bacterium which induces the decay of all organic matter, and to which, as preserving the balance between animal and vegetable matter, our thanks are due. All the other schizomycetes are in some way or another harmful to us.

Ptomaines are produced by bacteria as yet undescribed, and the same bacteria also produce phenol, which is remarkable, as phenol is detrimental to their existence; also in decaying matter phenylpropionic and phenylactic acids, indol, cresol, and scatol, etc., have been found. Reference is made to various fermentations, and to *Dispora caucasica*, which forms “kephir.”

Action of Hydrogen Peroxide on Organic Matters and Fermentations, and its Employment in Surgery. (*Comptes Rendus*, xciv. 1383, and xcv. 49.) MM. Paul Bert and P. Regnard have studied the action of hydrogen peroxide upon various forms of organic matter and upon fermentations, and find that it possesses very remarkable antiseptic properties. All fermentation due to an organized ferment is immediately and definitely arrested by hydrogen peroxide, the ferment is killed, and even after the removal of the hydrogen peroxide by one of the substances which destroys it most rapidly, the fermentation does not recommence. The yeast of beer is in this manner killed instantly, although it possesses itself

the property of decomposing hydrogen peroxide. Specimens of wine, urine, and milk, each containing a few drops of hydrogen peroxide, have been exposed for several months in open vessels without exhibiting the least sign of alteration, while other specimens of the same identical liquids, without the addition of hydrogen peroxide, placed beside them, were in a state of complete decomposition. Although organized ferments are destroyed by hydrogen peroxide, soluble ferments do not seem to be affected by it, saliva, diastase, the gastric and pancreatic fluids continue to act in solutions containing hydrogen peroxide. MM. Bert and Regnard have also studied the action of hydrogen peroxide upon various organic materials, including the albuminoid substances, and all the tissues composing the animal body in a healthy or pathological state. The results of their investigations may be summed up as follows:—

1. Hydrogen peroxide, even when very dilute, arrests fermentations due to the development of living organisms, and the putrefaction of all substances which do not decompose it.

2. It has no effect upon diastase fermentations.

3. Dilute hydrogen peroxide is not destroyed by fats, starches, soluble ferments, egg albumen, casein, the peptones, creatine, creatinine, or urea.

4. It is rapidly destroyed by nitrogenous collagens, by musculin, fibrin of the blood, and various nitrogenous vegetable matters.

5. This action is definitely arrested by a temperature above 70°. Putrefaction, however, leaves it entirely intact.

As it appeared from the powerful antiseptic properties of hydrogen peroxide that it might prove of value in surgery, experiments were made upon the point by MM. Péan and Baldy, at the hospital of St. Louis, with very successful results.

The hydrogen peroxide, in solutions containing from two to six times its volume of oxygen, according to the circumstances of the case, was used, both externally as a dressing for wounds, ulcers, etc., and also given internally in certain affections, in doses of from three to five grains, containing six times its volume of oxygen. As a result of their experiments, MM. Péan and Baldy consider themselves justified in stating:—

1. Hydrogen peroxide containing, according to circumstances, from two to six times its volume of oxygen, appears to be capable of advantageously replacing alcohol and carbolic acid.

2. It can be employed externally, for the dressing of wounds and ulcerations of all natures, in injections and in vaporizations, and internally.

3. The results obtained, even in the case of the largest operations, are, up to the present, in the highest degree satisfactory. Not only fresh wounds, but also old ones, proceed rapidly to cicatrization, and reunion by first intention of amputation wounds appear to be encouraged by this mode of dressing.

4. The general as well as the local state appears to be favourably influenced.

5. The advantages of hydrogen peroxide over carbolized water are its not having any poisonous effect nor unpleasant odour, while its application is entirely painless.

M. Bert calls attention to the fact that hydrogen peroxide for surgical use must be entirely neutral, while that obtained from the greater number of dealers in chemicals frequently contains a considerable quantity of sulphuric acid, so that its use would not be without danger.

Glyceroborates as Antiseptics. G. Le Bon. (*Comptes Rendus*, xcv. 145.) The author describes glyceroborates of sodium and calcium, both of which possess powerful antiseptic properties, and combine with these the advantage of not producing the slightest irritation, even when applied to the most delicate organs. Both also serve excellently for the preservation of meat. They are prepared by heating together, with constant stirring, equal parts of borate of soda or lime and glycerin, until a drop allowed to cool on a glass plate forms a brittle transparent bead. The whole mass is then poured on stone flags, and as soon as cool, broken into fragments and kept in stoppered bottles. Both are soluble in water and alcohol.

NOTES AND FORMULÆ.



PART III.

NOTES AND FORMULÆ.

A New Preparation of Ergotin. M. Conrad. (*Chem. and Drugg.*, 1883, 83.) This preparation consists of a very carefully prepared ergotin, mixed with gelatin, cast in small cylindrical rods. A rod of the kind is carried by the doctor in a cylindrical glass tube, which also serves for effecting the solution of the rod, the latter being treated therein with water, and warmed over the flame of a match. The solution is heated to the temperature of the body, and administered subcutaneously. The irritation is said to be but slight, and the effect certain. No formation of abscesses has been observed in a single case of hundreds of persons operated on.

Tamar Indien. Dr. H. Hager. (*Pharm. Centralhalle*, 1882, No. 26.) The author states that this well-known laxative is prepared thus:—

Tamarind pulp	.	.	.	.	.	450 parts.
Sugar, powdered	.	.	.	.	.	40 "
Sugar of Milk, powdered	.	.	.	.	.	60 "
Glycerin	.	.	.	.	.	50 "

Mix, with constant stirring, at a gentle heat, and evaporate to the consistence of syrup. Then incorporate with it,—

Senna, in fine powder	.	.	.	.	.	50 parts.
Anise, in fine powder	.	.	.	.	.	10 "
Oil-sugar of Lemon.	.	.	.	.	.	3 "
Tartaric Acid.	.	.	.	.	.	3 "

Make the ingredients into a plastic mass with the fingers, and form the whole into oblong tablets of an inch and a half long, by nine-tenths of an inch broad, and half an inch thick, and sprinkle with a powder prepared in the following proportions:—

Bitartrate of Potassium, powdered . . .	5 parts.
Sugar, powdered	35 "
Sugar of Milk, powdered	35 "
Tragacanth, powdered	3 "
Tartaric Acid, powdered	2 "
Red Saunders, powdered	25 "

Allow the tablets to dry in a warm place for an hour, and wrap them in tinfoil.

Mercurial Glycerin. F. Vigier. (*Gazz. Hebdom. de Med.; Chem. and Drugg.*, 1883, 172.) The absorption by the skin of any medication incorporated with a fatty substance is very feeble, except for mercurial ointment. According to the author any substance incorporated with glycerin (iodide of potash, chlorhydrate of morphine, etc.) is not absorbed. He considers that this property of glycerin is due to its not wetting the skin. Experiments on himself and his pupils have proved that the active substance thus incorporated never produces its constitutional effects. It is for this reason that he recommends glycerin instead of lard in mercurial preparations for scabies, pediculi corporis, etc., as they have an antiparasitic effect without being absorbed. The following glycerite, notwithstanding the caustic nature of its principal ingredient, may be used without danger:—

Hydrarg. Bichlorid.	ʒiss.
Glycerin.	ʒiij.

Glycerol of Myrrh and Borax. R. F. Fairthorne. (From *Amer. Journ. of Pharm.*) This preparation commends itself for many purposes, and will be found especially serviceable as an addition to gargles and tooth-washes, and as an application to sore nipples. It is made by the annexed formula:—

Myrrh, in coarse-powder	1 ounce.
Powdered Borax	1½ "
Glycerin,	
Water	āā 3 fl. ounces.

Mix the borax and myrrh together, add the other ingredients, and boil in a flask for ten minutes; strain through muslin, and add enough water to make the mixture 6 fluid ounces; when cold, filter through cotton or paper.

Solution of a considerable amount of the myrrh is effected by the borax, and the addition of glycerin enables a larger quantity of the borate of sodium to be dissolved than in water alone, producing a solution that is miscible with water without precipitation taking place.

This makes an elegant *lotion* for application to the gums, or as a *mouth-wash* when diluted with decoction of quillaia bark and flavoured with oil of rose or other essential oil.

The following is a very satisfactory formula:—

Glycerol of Myrrh and Borax	f ʒij.
Decoction of Quillaia (2 ozs. to Oj)	f ʒiv.
Oil of Rose	4 drops.
Oil of Cloves	6 „
Oil of Orange Peel	6 „

Mix and filter.

Glycerole of Chloral and Camphor. C. Pavesi. (*Bollet. Farmac.*, 1882, 309.) The author recommends, as a very effectual anodyne embrocation in rheumatic, gouty, neuralgic, and arthritic affections, the following mixture:—

Camphor, in powder	5 grams.
Chloral Hydrate	4 „
Glycerin	20 „
Alcohol	15 „
Oil of Juniper	2 „

Mix in a vial, and expose to a gentle heat (not over 40° C. or 104° F.) until solution has been effected. Let cool, and keep the vial well stoppered.

Elixir of Blackberry. R. F. Fairthorne. (From *Amer. Journ. of Pharm.*)

Fluid Extract of Blackberry	f ʒivss.
Syrup of Blackberry Fruit	f ʒxv.
Jamaica Spirit	f ʒxij.
Curaçoa Cordial,	
Cinnamon Water	āā f ʒiv.
Syrup of Orange Peel	f ʒiiij.
Oil of Cloves,	
Oil of Allspice	āā 12 drops.

Mix the essential oils with the fluid extract of blackberry, add the Jamaica rum, and afterwards the other ingredients.

Elixir of Logwood. R. F. Fairthorne. (From *Amer. Journ. of Pharm.*)

Extract of Logwood	10 dr. 2 scr.
Brandy	12 fl. ounces.
Curaçoa	6 „ „
Syrup	6 „ „
Oil of Nutmeg,	
Oil of Cinnamon	āā 4 drops.
Warm Water sufficient to make	2 pints.

Dissolve the extract in the water, add the other ingredients, and when cool filter.

Aromatic Syrup of Liquorice. A. Shyrock. (*Amer. Journ. of Pharm.*, 1883, 305.) Having frequent demands for syrupus glycyrrhizæ aromaticus, in combination with salts of quinine, the author has adopted the following formula, by which a preparation is obtained not only disguising the bitterness of the alkaloid, but also imparting a delicate aromatic and astringent flavour.

Extractum Glycyrrhizæ fluidum	.	.	.	25 parts.
Extractum Aromaticum fluidum	.	.	.	10 „
Mel Rosæ	.	.	.	15 „
Syrupus	.	.	.	50 „

Mix them.

Syrup of Hydriodic Acid. R. H. Kimball. (*Drugg. News.*) The author gives the following as an easily worked method of making this syrup:—

Iodine Resublimed	.	.	.	480 grains.
Carbon Bisulphide	.	.	.	6 ounces.
Distilled Water	.	.	.	6 „
Syrup	.	.	.	q. s.

Suspend the iodine, tied in a piece of muslin, in the bisulphide of carbon, contained in a closed bottle, until it is all dissolved; then add the distilled water, and pass through the mixture a current of hydrosulphuric acid gas until the lower stratum of liquid has acquired a pale yellow colour. Remove the upper stratum of liquid (which should be milky) with a glass siphon, being careful that all is removed; filter the liquid thus obtained through a *white* filter, and place in a porcelain capsule over a water-bath, until the odours of hydrosulphuric acid and bisulphide of carbon have disappeared. Then set the capsule aside, well-covered, until the contents have cooled. Then add a sufficient quantity of syrup made of four pounds of pure sugar and two pints of distilled water, strained through muslin, to make the finished product measure seventy-two fluid ounces. Put into four or eight ounce bottles, protected by paper from light, cork securely, and keep in a cool, dark place.

Syrupus Juglandis Compositus (Compound Syrup of Butternut Leaves). (*New Remedies*, from the non-official formulary of the Dutch Society for the Advancement of Pharmacy.) This syrup, also known as Vanier's Antirhachitic Syrup, is prepared as follows:—

Extract of Butternut Leaves	4 parts.
Extract of Brown (grey) Cinchona	2 „
Alcohol	4 „
Port Wine	6 „
Syrup	180 „
Iodide of Potassium	1 „
Oil-sugar of Anise (1 part of oil and 50 parts of sugar)	3 „

Mix the extracts with the alcohol, port wine, and 10 parts of syrup. Dissolve the iodide of potassium and the oil-sugar of anise in 170 parts of syrup, and mix the two liquids.

Syrupus Juglandis Compositus cum Oleo Morrhuæ (Compound Syrup of Butternut Leaves with Cod-liver Oil). (*Ibid.*)

Compound Syrup of Butternut Leaves	19 parts.
Cod-liver Oil	1 part.

Mix them.

Syrupus Lactucarii (Syrup of Lactucarium). (*Ibid.*)

Lactucarium	1 part.
Sugar	q.s.
Water	q.s.

Rub the lactucarium with a little sugar and 180 parts of water; then heat to boiling, and filter the liquid. In 10 parts of the liquid dissolve 19 parts of sugar.

Syrupus Ferri Oxidi (Syrup of Oxide of Iron). (*Ibid.*)

Solution of Chloride of Iron (ferrie), sp. gr.	
1.480-1.484	12 parts.
Ammonia Water	14 „
Sugar	85 „
Distilled Water.	q.s.

Mix the solution of chloride of iron with 120 parts of distilled water. Add to it slowly, under constant stirring, the ammonia water previously diluted with 140 parts of distilled water. Collect the precipitate, wash it with distilled water until it ceases to produce a cloudiness in test-solution of nitrate of silver, and mix it with the sugar in a porcelain capsule. Warm the mixture for a few hours on the water-bath, occasionally stirring, then boil it gently, with occasional addition of distilled water, until one drop diluted with distilled water yields a clear, light brown solution. Then dilute the syrup with warm distilled water until it weighs 136 parts.

Preserve the syrup in well-stoppered bottles in a dark place.

One part of the syrup diluted with 5 parts of water should not produce a precipitate.

Fifty parts of the syrup contain 1 part of ferric oxide.

Tinctura Antasthmatica (Anti-Asthmatic Tincture). (*Ibid.*, Aug., 1882.)

Licorice Root, cut and bruised	. . .	12 parts.
Iris (blue-flag) Root	. . .	6 „
Squill, dried and bruised.	. . .	3 „
Saffron, finely cut	. . .	2 „
Alcohol	. . .	214 „
Benzoic Acid	. . .	1 „
Sugar	. . .	18 „

Macerate the first four ingredients with the alcohol during fourteen days; then express and dissolve in the strained liquid the acid and sugar. Finally filter.

Tinctura Antifebrilis Warburgi (Warburg's Fever Tincture). (*Ibid.*)

Tincture of Orange Peel	. . .	5 parts.
Compound Tincture of Aloes	. . .	20 „
Stronger Alcohol	. . .	15 „
Spirit of Camphor	. . .	2 „
Sulphate of Quinine.	. . .	1 „

Dissolve the sulphate of quinine in the alcohol, and add the other liquids.

N.B.—Tincture of orange peel (Pharm. Neerl.) is prepared by macerating 1 part of sweet orange peel (only the outer yellow portion) with 6 parts of alcohol for fourteen days.

Compound tincture of aloes (Pharm. Neerl.) is prepared by mixing equal parts of tincture of aloes (aloes 1, alcohol 8), tincture of myrrh (myrrh 1, stronger alcohol 8), and tincture of saffron (saffron 1, alcohol 8).

Spirit of camphor (Pharm. Neerl.) is composed of camphor 1, stronger alcohol 12 parts.

Tinctura Anticholerica Bastleri. (*Rundschau*, 1882, 675.) Most of the published formulæ for this preparation yield a turbid mixture, which on standing separates into two layers. The following formula, furnished by Labler, yields an unexceptionable preparation: Digest for three days cinnamon (5 parts) in strong alcohol (25 parts); express, and to 24 parts of the tincture obtained add volatile oils of anise, cajuput, and juniper berries, each 4 parts, spirit of ether 12 parts, and Haller's acid elixir 1 part; finally, filter.

Vinum Amarum cum Spiritu (Bitter Wine with Alcohol). (*New Remedies*, Aug., 1882.)

Gentian, finely cut	4 parts.
Red Bark (Indian or Japanese), in coarse powder	8 „
Orange Peel, deprived of the white layer, and finely cut	1 „
Canella, in coarse powder	1 „
Alcohol	30 „
Sherry Wine	200 „

Macerate the solids with the alcohol for twenty-four hours, then add the sherry, macerate for four days, strain, express, and filter.

Vinum Camphoratum (Camphor Wine). (*Ibid.*)

Camphor, in powder	1 part.
Acacia, in powder	1 „
White Wine	44 „
Stronger Alcohol	4 „

Mix them. It forms a white turbid liquid.

Chlorodyne. Dr. J. H. Gilman. (*Ibid.*, Sept., 1882.) The author gives the following formula for chlorodyne, in which the ingredients are so combined as to form a perfect solution, and which can be diluted with 10 parts of water without separation.

Chloroform	fl. oz. 2
Ether (stronger)	„ $\frac{1}{2}$
Alcohol ("95" per cent.)	„ 8
Oil of Peppermint	min. 24
Tincture of Capsicum	fl. dr. 6
„ Cardam., comp.	fl. oz. 2
Fluid Extract of Licorice Root	„ 2
Diluted Hydrocyanic Acid	„ 1
Glycerin	„ 16
Sulphate of Morphia	grains 40

Mix in the order quoted, and shake until dissolved. Dose: 10 to 30 drops.

Extract of Malt with Quinine. (*Ibid.*)

Extract of Malt	195 parts.
Hydrochlorate of Quinine	1 part.
Glycerin	4 parts.

Dissolve the hydrochlorate of quinine in the glycerin, and mix it with the extract of malt.

This preparation should be freshly made when wanted for use.

Extract of Malt with Iodide of Iron. (*New Remedies.*)

Extract of Malt	96 parts.
Solution of Iodide of Iron	4 „

Mix them.

The solution of iodide of iron is prepared by bringing together 3 parts of iron with 8 parts of iodine, and enough water to make 40 parts when the reaction is completed and the liquid filtered. Twenty parts of this solution contain 5 parts of ferrous iodide.

This preparation should be freshly made when wanted for use.

Preparation of Malt Extract and Malt Jelly. L. Hoff. (*Journ. Soc. Chem. Ind.*, 1882, 330.) Malt which has been allowed to sprout as long as possible, is peeled and shucked, so that none of the grain is lost. The malt extract is then obtained by evaporation, either in a vacuum or over direct fire. Before gelatinating it is filtered through charcoal in order to make it of a lighter colour, and to remove fermentative germs. The filtered extract is heated in an enamelled vessel to 100°, and gelatinous substances, such as agar-agar, gelatine, isinglass, etc., in the liquid state, are added with constant stirring.

Pills of Oxide of Copper as a Remedy for Tapeworm. Dr. H. Hager. (*Zeitschr. des oesterr. Apoth. Ver.*, 1883, 137.)

Black Oxide of Copper	6 parts.
Carbonate of Lime	2 „
White Bolus	12 „
Glycerin	10 „

Let 120 pills be made. Two pills to be taken four times a day, and to be continued for a fortnight, during which all acid food and drink is to be avoided. It is advisable to terminate the course with a dose of castor oil.

For children one pill instead of two is to be taken each time.

Blaud's Pills. (*Pharmaceut. Zeitung*, 1882, 564.) The following modifications for the preparation of these pills are suggested:—

1. Exsiccated ferrous sulphate, 10·12; potassium carbonate, 15·0; milk-sugar, 6·0; syrup, 7·5 grams. Make 100 pills. A metallic lustre, exceeding in elegance the coating with gold or silver, may be given to the pills by rolling them upon a hard board in coarsely powdered graphites, dampened with a few drops of alcohol.—*M. V. Valtä.*

2. Potassium carbonate, ferrous sulphate, of each 15·0; powdered althea, 1·5; tragacanth, 1·0; glycerin ointment (composed of glycerin and tragacanth), 1·0 to 1·5 gram. A greenish plastic mass is the

result, from which pills are obtained which harden in ten or fifteen minutes and are not deliquescent.—*E. Rudeck.*

3. The water of crystallization contained in the ferrous sulphate is to be replaced by powdered althea, the mass formed with a mixture of equal parts of mucilage and glycerin, and the pills dried in a drying closet.

4. Potassium carbonate, 15·0; exsiccated ferrous sulphate, 7·5; powdered althea, 7·5; powdered tragacanth, 0·3; glycerin, sufficient. Make 100 pills.—*O. Spoerl.*

5. Like 3, except that the mass is formed with honey.

Pasta Escharotica (Canquoin's Caustic). (*New Remedies*, from the non-official formulary of the Dutch Society for the Advancement of Pharmacy.)

	No. 1.	2.	3.	4.
Chloride of Zinc, parts . . .	1	1	1	1
Wheat Starch or Linseed Meal, parts	2	3	4	5

Mix them to a paste by means of water, roll it out, form it into suitable pieces, and deliver them in well-closed bottles.

The paste should be freshly made when wanted for use.

Tropic Fruit Laxative. A. Conrath. (*New Remedies*, February, 1883.) The author gives the following approximative formula for the preparation sold under the name of "Tropic Fruit Laxative": jalap tubers, powdered; senna leaves; sugar, of each 5 parts; pulp of East India tamarinds (of the consistence of a stiff extract), 30 parts.

Having rolled out the mass with a rolling-pin to a thickness of $\frac{1}{4}$ of an inch, it is to be cut with a tin mould to a size of 1 inch long by $\frac{7}{16}$ of an inch wide, to weigh 40 to 45 grains. The lozenges should be coated by a confectioner with chocolate and sugar, after which each one may be wrapped in tinfoil. The author says that the objection to dispensing this form of a confection of senna is the liability of the laxative portion to become wormeaten; in which case, those who do not first remove the chocolate and examine the central mass, are apt to swallow worms and all.

Orange-flower Water. H. M. Wilder. (*Druggists' Circular.*) Take three to four drops of a fine quality of oil of neroli petale, drop them on a small piece of filtering paper, some three inches square, put the paper into a quart bottle, pour on four fluid ounces of warm distilled water, about 100° F., and shake well for a couple of minutes; then add warm distilled water up to one pint, and shake the whole from time to time till cold; lastly, filter. This gives the best artificial orange-flower water which can be made.

However fine the oil, the water will never equal that distilled from the fresh flowers, because, as Soubeiran remarks, the very finest oil cannot be obtained by distillation, but remains in the water contained in the still. For flavouring purposes, the addition of two fluid drachms of good distilled rose-water (or that made from kissanlik oil) to the pint of orange-flower water, as made above, is quite an improvement.

Deodorized Cod-liver Oil with Iron. W. A. Henry. (*New Remedies.*)

Cod-liver Oil	1 pint.
Sulphate of Iron, dried	64 grains.
Castile Soap, powdered	128 „
Charcoal, powdered	1 ounce.
Coffee, ground	$\frac{1}{2}$ „

Or,

Chocolate, powdered	$\frac{1}{4}$ ounce.
Hot Water	q. s.

Dissolve the sulphate of iron and castile soap, each separately, in a sufficient quantity of hot water, mix the two solutions, and after washing the resulting precipitate (oleate of iron) with water, triturate the oleate in a mortar with cod-liver oil (previously heated in a water-bath) gradually added; then the remaining ingredients; heat the whole in a water-bath for an hour, and filter, while hot, through paper or flannel.

The oleate of iron, which each tablespoonful of this preparation contains, is equivalent to nearly one grain of the sulphate of iron. To increase the quantity of iron in the above formula, twice the amount of the sulphate and soap may be used; the preparation would then contain oleate of iron equivalent to nearly eight grains of sulphate of iron to the fluid ounce, or one grain to a teaspoonful, the latter modification being adapted to the administration of small doses of the oil.

The preparation has a dark brown, almost transparent, appearance, the oleate of iron combining readily with the warm oil. It retains only a faint odour of cod-liver oil, the charcoal assisting as a deodorizing agent, and the chocolate or coffee adding flavour to the same. It has the advantage of being acceptable to persons who would reject the oil in its unmodified form.

Salicylic Acid as a Remedy for Corns. (*Pharm. Journ.*, 3rd series, xiii. 884.) Dr. T. Green, writing to the *Medical and Surgical Reporter*, speaks highly of the results obtained in the treatment of

hard and soft corns with salicylic acid. He has adopted a formula by M. Gezon, which is as follows:—

R	Salicylic Acid	30 parts.
	Ext. Cannabis Indicæ, solid	5 „
	Collodion	240 „

The author says the collodion fixes the acid on the diseased part, and gives speedy relief by protecting it from friction. The cannabis indica acts as an anodyne, and the acid reduces and loosens the corn, so that it comes off in four or five days, adhering to the collodion. The remedy is applied with a camel's hair pencil, and if the corn is not well cured, the application may be repeated. In four or five days the patient should use a warm foot-bath and rub off the collodion. If any portion of the corn remains, the acid should be applied again, until the whole of the corn has disappeared. The skin will be soft and smooth, as in the healthy state.

The mixture dries immediately, and does not prevent for a moment the use of the stocking.

The author has used this preparation in the treatment of bunions with equally good results.

Flexible collodion is preferable to ordinary collodion in the above formula.

Masking the Odour of Iodoform. Dr. C. Scherk. (*Pharmaceut. Zeitung*, 1882, 740.) The author recommends carbolic acid. On rubbing together 10 grams of iodoform with .05 gram carbolic acid, and two drops of oil of peppermint, the disagreeable odour of iodoform is completely masked, and will not appear again even on heating. The addition is somewhat less effectual if vaselin be used for the ointment; but is still more agreeable than tonka, balsam of Peru, oil of caraway, or oil of peppermint alone.

Camphorated Sulphur Lotion. P. Vigier. (*N. Y. Med. Journ.*, January 20, 1883.) The author recommends the following modification of the *lotion au soufre et au camphre*:—rose water, 250; camphor, 30; precipitated sulphur, 20; powdered gum arabic, 8 parts. This remains a homogeneous mixture for a considerable length of time, and, when in the course of time the insoluble constituents have separated, may again be made uniform by gentle agitation.

Mel Rosæ. S. Plevani. (*Journ. de Pharm. et de Chim.*) The author suggests the following as an improvement on the formula of Mel Rosæ:—

Petals of fresh Roses	125 grams.
White Sugar	50 „

Beat together by gradual additions in a marble mortar with a wooden pestle. Add—

White Honey.	350 grams.
Water	100 „
Distilled Rose-water	50 „

Mix, heat in a sand-bath, and afterwards express. Let it stand and deposit, and decant.

This yields a preparation of a fine rose colour, with an astringent and acid taste and marked odour. Kept in a well-stoppered bottle, it may be preserved in good condition for a year.

Eriodictyon Glutinosum as a Disguise for the Taste of Quinine. J. K. Lilly. (*New Remedies*, 1883, 20.) The author proposes that a syrup of *Eriodictyon glutinosum*, Benth., otherwise known as “Yerba Santa, Mountain Balm, or Consumptive’s Weed,” be used to cover the taste of quinine. He prepares such a syrup by the following method (taken from the *Chicago Medical Review*):—

Fluid Extract Yerba Santa	4 parts.
Water	8 „
Powdered Pumice	1 „
Granulated Sugar	14 „

Mix the fluid extract with the water, evaporate to seven parts, shake with pumice, allow to stand, decant, add sufficient water to preserve measure, then with heat dissolve the sugar. The addition of fluid extract of licorice in the proportion of half a drachm to the ounce of syrup, or of aromatics, adds somewhat to the elegance of the preparation. When quinine or other bitter substances are suspended in this syrup, their taste is completely masked. It is far superior to the licorice preparations used for the same purpose, is pleasant and agreeable, and is easily prepared.

Administration of Aspidospermine. M. Eulenberg. (*Med. Kal.*, 1883.) This active principle of quebracho bark, which has lately acquired some reputation for the relief of difficult breathing attending asthma, emphysema, phthisis, etc., is given in doses of about one-third of a grain; the dose of the bark being about half a drachm. The author gives the following formula for its exhibition:

Aspidospermine	gr. xv.
Distilled Water	f ʒiss.
Sulphuric Acid	q. s.

to make a solution. M. Dose, 15 minims.

Antidiphtheritic Inhalation. (*New Remedies.*) Some years ago, Dr. H. Hager recommended a mixture composed of—

Carbolic Acid	10 parts.
Alcohol	10 „
Water of Ammonia	12 „
Distilled Water	20 „

as an excellent inhalation in catarrhal affections. It was directed to be used thus: a small wide-mouthed bottle was to be filled one-third with the liquid; then a sufficient quantity of cotton was to be introduced to just soak up all the liquid. The bottle was then to be well stopped. In coryza, incipient catarrh, or similar affections, the inhalation through the nostrils of some of the vapour of the compound was found to be of the greatest benefit.

The same author now recommends a still stronger compound, to be made from—

Carbolic Acid	10 parts.
Oil of Turpentine (or Oil of Eucalyptus)	5 „
Water of Ammonia	12 „
Alcohol	20 „

A small quantity of this is to be dropped into a small wide-mouthed bottle half-filled with cotton or asbestos, and the bottle well stopped. After a few days, a little more may be added, until a strong odour is given off, when the bottle is opened.

A physician to whom Dr. Hager recommended the use of the compound thinks that it prevents the spread of diphtheria, since in five families, in each of which one case of diphtheria had become developed, its further spread was arrested, apparently through the use of the antiseptic inhalation. In another family, a second child was taken with the disease; but the child could not be coaxed to inhale the vapour. The inhalation should be as full and deep as possible. In some cases of coryza, it has been used with most excellent effects.

Should the odour of oil of turpentine be too offensive to any person, oil of eucalyptus may be substituted for it.

Disinfecting Pastilles. (*Répert. de Pharm. and New Remedies.*) C. Tanret has been very successfully endeavouring to make fumi-gating pastilles that should be not merely pleasantly odoriferous, but disinfecting. Pastilles made in the ordinary way, with charcoal, nitre, and the usual sweet-smelling compounds, may be soaked in liquid antiseptics, like creasote and eucalyptol; or if solid, like carbolic acid and thymol, the disinfectant may be melted at a low

heat, and dropped upon them until they will absorb no more. An eighth of an inch or so of the apex of the cone must be left free, otherwise the pastille will not light. It is better to drop a definite quantity of the disinfectant on each pastille, as by soaking, if very porous, they are liable to imbibe too much to burn steadily; besides which, in the case of thymol and carbolic acid, crystals will form on the surface. During the combustion of these antiseptic pastilles, there is an actual distillation of the antiseptic, which passes off into the air of the room in which they are burnt in the form of vapour, very little of it being decomposed by the heat, both creasote and carbolic acid, for instance, being themselves produced at a high temperature. This is easily proved by the characteristic odour of the vapour. Although the thymol pastilles only contain half as much of the disinfectant material as those made with carbolic acid, they are nevertheless twice as strong as the latter, the disinfecting powers of carbolic acid and thymol being as 1 to 4, according to Kuhn and Jalan de la Croix. The inhalations of the fumes of such pastilles may be of great service in diseases of the respiratory organs.

Iodoform Ointment with Vaseline. (*New Remedies*, 1882, 274.) M. Hoffmann recently published in the *Pharmaceutische Zeitung* a note recommending to prepare iodoform ointment with vaseline by the aid of a gentle heat rather than by mere mechanical mixture. The vaseline having been melted on a water-bath, the requisite amount of iodoform is added, and after a short digestion, it will be completely dissolved. Even on cooling, no iodoform was seen to crystallize out when examined with a lens. The author adds that such an ointment necessarily must be more rapidly absorbed; besides, the disagreeable odour of iodoform appears to become less intense under this treatment.

In a subsequent number of the same journal, another correspondent publishes the following: "Induced by the communication of M. Hoffmann, and in view of the frequent call, in this place, for iodoform ointment made with vaseline, I tried his method of preparation, not omitting, of course, to notify the prescribing physician of the change. The ointment had previously been prepared by merely mixing one part of the iodoform with ten parts of vaseline, and had been well borne by the first person upon whom it was used. But, prepared with the aid of heat, it was followed, soon after application, by symptoms of poisoning, such as are sometimes noticed after the external use of iodoform. In consequence thereof, the physician requested that the ointment be subsequently prepared only by simple mixing."

The same correspondent adds, that vaseline digested with iodoform dissolves only a small quantity of the latter. Most of it is contained in the ointment in a state of fine division; and the ointment itself has an entirely different colour, and is softer, than that made by mere mixing.

Castor-oil Soap for Linimentum Saponis Compositum. M. S. Hammer. (*Proc. Cal. Pharm. Soc.*, 1883, 50.) This soap, which seems to answer best for this liniment, may be prepared by the following process:—Saponify two pints of castor oil with six ounces of caustic potash and two pints of water, by heating until a transparent mixture is obtained; then add a saturated solution of eight ounces of sodium chloride, stir until cool, allow to subside for a day, decant the liquid portion, cut in pieces and dry for use.

Medicated Soaps. (*Seifenfabrikant.*)

Tannin Soap.—9 kilos. of cocoa-nut oil are saponified with $4\frac{1}{2}$ kilos. of soda lye, then 250 grams of tannin, which has been previously dissolved in spirits, are put in and mixed. The soap is perfumed with 30 grams Peru balsam, 10 grams cassia oil, 10 grams oil of cloves.

Iodine Soap.—10 kilos. cocoa-nut oil, 5 kilos. lye at 38° B., $1\frac{1}{2}$ kilo. of iodide of potassium, dissolved in $\frac{1}{2}$ kilo. of water.

Gall Soap.—1 kilo. of galls is stirred in 25 kilos. of melted cocoa-nut oil, and the latter then saponified cold with $22\frac{1}{2}$ kilos. of soda lye at 38° B. The soap is coloured with 350 grams of ultramarine green, and perfumed with 75 grams lavender oil, 75 grams cummin oil.

Camphorated Sulphur Soap.—12 kilos. of cocoa-nut oil, 6 kilos. of soda lye of 38° B., 1 kilo. of sulphate of potassium, dissolved in $\frac{1}{2}$ kilo. of water; 160 grams of camphor, which is to be dissolved in the melted cocoa-nut oil.

Petroleum Soap. L. Bastil. (*Chem. and Drugg.*, 1882, 531.) In the author's process, equal proportions of animal or vegetable fats are used with petroleum. The fatty matter is melted, and a half per cent. of boracic acid is fused into it. A similar quantity of boracic acid is in like manner added to the mineral oil at the temperature of 90° F. A $\frac{1}{2}$ per cent. of boracic acid is also dissolved in the alkaline solution. The acidified oils are mixed by gradually pouring the melted animal or vegetable fat into the mineral oil with constant stirring. The alkali containing the boracic acid is then added, still maintaining the agitation. The saponification is completed by further addition of as much ordi-

nary alkaline solution as may be required, and finishing off in the usual manner.

Liniment for Itch. Dr. Brunnengraeber. (*Pharm. Handelsblatt*, 1883, No. 1.) This liniment, which the author has very successfully employed for some time, consists of purified storax, 40 parts; olive oil, 5 parts; and alcohol, 5 parts.

Collyrium for Inflamed Conjunctiva. Dr. C. R. Agnew. (*New Remedies*, 1882, 236.) A solution in common use in the Manhattan Eye and Ear Infirmary, of New York, as an application to the eye, is the following. It is applied as a spray by means of an atomizer :—

Tannin	gr. x.
Biborate of Soda	gr. xx.
Glycerin	5ij.
Water	Oij.

Brassicon. (*Pharm. Zeitschr. für Russland*, 1882, 783.) This is the name of a compound which has long been in use in the province of Kiew (Russia) as a remedy against headache. The mode of administration is not stated. It is composed of,—

Oil of Peppermint	30 grs.
Oil of Mustard, volatile	6 gtt.
Camphor	10 grs.
Ether	60 grs.
Alcohol (90 %)	180 grs.
Tincture of Peppermint (or Melissa), enough to impart colour.	

Lime Juice and Pepsin. (*Chem. and Drugg.*, 1883, 25.) The *Deutsch. Amerikan. Apoth. Zeitung* gives a formula for this compound; but as the title has been previously used in England, it might be desirable, if adopted, to name it differently :—

Lemon Juice	4 ounces.
Cognac	6 „
Syrup Sweet-orange Peel	4 „
Water	2 „
Saccharated Pepsin	64 grains.

Dissolve the pepsin in the water, add the cognac, then the lemon-juice, and lastly the syrup; filter.

A Substitute for Castor Oil. Dr. Soper. (*Lancet*, Feb. 10th, 262 and 303; and *Pharm. Journ.*, 1883, 3rd series, xiii. 683.) The author recommends the use of a mixture of equal parts of glycerin and castor oil, slightly flavoured with oil of almonds or

lemon, as an agreeable substitute for castor oil. He states that of this mixture a teaspoonful is an effective dose, and in cases of chronic constipation, hæmorrhoids and anæmia, it has proved most useful. He has found half-teaspoonful doses useful in the early stages of bronchitis, in which it seems to promote exudation from the bronchial tubes, and is certainly expectorant. Dr. Soper having stated that there was some difficulty in making the two liquids mix, Mr. Brewis, a Portsmouth chemist, in the succeeding number points out that if the glycerin be first poured into a mortar and the castor oil added very gradually, triturating thoroughly meanwhile, the result will be a perfectly homogeneous jelly-like emulsion, which, even after the lapse of twenty-four hours shows no signs of separation, and in which the taste of the oil, if the finest Italian kind be used, is quite disguised.

Substitute for Gutta-Percha. M. Zingler. (*New Remedies*, 1883, 177.) About 50 kilos. of powdered copal and $7\frac{1}{2}$ to 15 kilos. of sublimed sulphur are mixed with about double the quantity of oil of turpentine, or with 55 to 66 litres of petroleum, and heated in a boiler provided with a stirring apparatus to a temperature of 122–150° C., and stirred until completely dissolved. The mass is now allowed to cool to 38° C., and mixed with a solution of about 3 kilos. of casein in weak ammonia water, to which a little alcohol and wood-spirit had been add. The mass is then again heated to 122–150° C., until it is a thin fluid. It is now boiled with a 15 to 25 per cent. solution of nutgall or catechu, to which about half a kilo. of ammonia had been added. After boiling for several hours, the mass is cooled off, washed in cold water, kneaded in hot water, then rolled out and dried.

Soluble Gelatin Bougies. J. C. Martin. (*Druggists' Circular*.) The author has prepared a great number of these bougies for hospital use, and they have given complete satisfaction. He gives the following directions:—

Take of the best French gelatin any desired quantity, macerate it in cold water until thoroughly softened. Press out as much water as possible, and transfer the gelatin to a water-bath. Add glycerin in the proportion of 4 parts by weight to 5 parts of the gelatin. Heat until the gelatin is dissolved, and after allowing the mixture to cool somewhat, add the medicinal ingredients. Then, having well oiled the pill machine, pour the mixture, which should be very thick, into the grooves of the machine, and also the cutter, completely filling them. By pressing the cutter on the machine the half-cylinders are joined together, and the excess of gelatin is

squeezed out. The cylinders will now be found perfect, and can be taken out and the edges trimmed off. If they are desired of a greater length than the machine will cut, two or more may be joined by gently heating and pressing them together for a few seconds. Any degree of hardness may be obtained by varying the proportions.

A Process for Coating Pills with Gelatin. C. W. Holmes. (*Proc. New York State Pharm. Assoc.*, 1882.) The writer has made use of a round tin cup, about three inches in diameter, in appearance like an ordinary blacking-box cover. The needles used were "No. 1 sharps," ordinary make. A thin layer of paste of plaster of paris and water is poured into each cup, and the needles set in the plaster. Each cup will hold twenty-five needles. Place one in the centre, and around that run two circles,—the first, half the distance between the centre and the edge of the cup; this circle to contain eight needles. The outer circle within one-eighth of an inch of the edge; this circle contains sixteen needles. If the distances are properly divided, the needles will be far enough apart to hold the largest pill without fear of contact. After the plaster has set make more paste, thin enough to pour, then fill the cup. Let it stand until the plaster is firm, and then the cup is ready for use. The pills are readily stuck on the needles by hand, transfixing them as lightly as possible. The pill is now ready for coating. The coating solution is prepared as follows:—

R	Best French Gelatin	3iv.
	Gum Arabic	3j.
	Sugar	3j.
	Water	q. s.

Dissolve the gum arabic and sugar in eight ounces of hot water in a capsule by means of a water-bath. Then add the gelatin and stir it until dissolved. Should the water have evaporated to such an extent that the solution is apparently too thick, add water gradually until it has the consistency of hot syrup. Continue the heat until a pellicle forms on the surface, then pour into a cold dish. A sixteen-ounce porcelain-covered casserole, with handle and lip, is a convenient dish to use, or a tin vessel may be made use of, a pint cup with a lip being about the size. Let the solution stand until the temperature is somewhat lowered, stir up the solution, to break the pellicle, and then dip the pills into the solution, lowering carefully until completely immersed. Pull them out slowly, that the surplus gelatin may run off, and then bring the needles to a

horizontal position, and rotate slowly for half a minute, when the cup may be set down. As soon as the coating is sufficiently set to prevent adhering to the fingers when touched, the pills are ready to come off.

Take an alcohol lamp with a small flame, and let the needle strike the flame about half an inch from the pill. As soon as the needle is heated, the gelatin begins to swell. Twist the pill off carefully, before the needle gets sufficiently hot to soften the pill, and with the finger stop the hole while the gelatin is hot. The pill is then ready to dispense.

If it is intended to keep the pills in stock, they should be exposed to the air for a few hours before bottling. After the process is finished pour the coating solution into a wide-mouth pint bottle, and when cold pour on sufficient alcohol to make a stratum half an inch deep on the surface of the gelatin, and cork tightly. In this way the gelatin will keep for any length of time. When necessary to use again, pour off the alcohol into a smaller bottle (kept ready for that purpose), place the gelatin bottle in a half gallon tin measure, putting a large piece of cork in the bottom, to protect the bottle from direct heat, fill the measure nearly to the neck of the bottle with cold water, and put over the gas flame or on the stove. Continue the heat until the gelatin is thoroughly liquefied, and then pour into the coating-dish previously used. Place the empty bottle in the measure to keep it hot. As few or as many pills as you wish may be coated, and then the solution at once returned to the bottle. After the pills have been removed from the needles, the next consideration is to restore the needles to their original condition.

A tin pan, or any convenient vessel having a flat bottom, is filled to the depth of an inch with hot water, and the cup is set in, the points being placed downward, the water not being deep enough to reach the cup. As soon as the gelatin is soft take the cup out, and with a small notched stick push the gelatin bulbs off, and then plunge the points into a bag of coarse emery a few times. This polishes the needles, and they are then laid aside until wanted again.

The only point of difficulty in the process, to the average pharmacist, will be the proper consistence of the coating solution. If the coating is too thin on the pill, or does not cover it perfectly, evaporate the solution somewhat. Should it form too thick a coat, add a little hot water and stir well. A pellicle forms rapidly, and it is necessary to stir frequently to prevent the pellicle from adhering to the pills as they are drawn out of the solution.

Preservation of Glue. J. Horadam. (*Ber. der deutsch. chem. Ges.*, xvi. 984.) The jelly is protected against putrefaction by adding 10 per cent. of chloride of calcium or chloride of magnesium. An addition of 30 per cent. will keep even liquid glue.

A New Insecticide. Dr. Nessler. (*Répertoire de Pharm.*) The preparation spoken of is said to enjoy a great reputation among German horticulturists. It consist of soft soap, 4 parts; extract of tobacco, 6 parts; amylic alcohol, 5 parts; methylic alcohol, 20 parts; water to make 1,000 parts. The extract of tobacco is made by boiling together equal parts of roll tobacco and water for half an hour, adding water to make up for what is evaporated. The soft soap is first dissolved in the water with the aid of a gentle heat, and the other ingredients are then added. The mixture requires to be well stirred before it is used, and is applied by means of a brush or a garden syringe fitted with a small rose.

A Protective Application against Mosquitoes. (*Deutsch. Amer. Apoth. Zeitung.*)

Ol. Picis liquid.	. . . . .	℥j.
Ol. Olivar	. . . . .	℥j.
Ol. Menth. Puleg.	. . . . .	℥ss.
Sp. Camph.	. . . . .	℥ss.
Glycerini	. . . . .	℥ss.
Acid. Carbolic.	. . . . .	℥ij.

Shake well together.

Emulsion of Cod-liver Oil with Phosphate of Calcium. E. B. Merriam. (*Amer. Journ. of Pharm.*, 1882, 388.) Made by the following process, this preparation will retain the insoluble calcium phosphate in suspension for a long time :—

Well-washed Phosphate of Calcium, dry and in fine powder	grs. clx.
Pure Muriatic Acid, a sufficient quantity, about	f ʒv.
Water of Ammonia, a sufficient quantity, about	f ʒiiss.
Best Cod-liver Oil	f ʒviij.
Pure Glycerin.	f ʒj.
Gum Arabic, in powder	℥j.
Oil of Nutmeg	℥v.
Oil of Lemon	℥x.
Oil of Gaultheria	℥v.
Water, sufficient to make	f ʒxvj.

Dissolve the phosphate of calcium in the muriatic acid, dilute the solution with ten times its volume of water, and add the water of

ammonia, also diluted with water, until it ceases to produce a white precipitate. Throw the whole on a filter, and wash as long as the washings render a solution of nitrate of silver turbid. To this precipitate, contained in a capsule, add the glycerin, and apply a gentle heat until the mass is well diffused and the mixture becomes nearly clear; then remove, and mix it with the mucilage, and make the emulsion in the usual way.

Preparations are sometimes sold under the names of cod-liver oil, lime, and iron, and cod-liver oil and wild cherry. The former can be made by adding two grains of pyrophosphate of iron to each teaspoonful of the above emulsion; the latter, by shaking two ounces of the fluid extract of wild cherry bark with fourteen ounces of simple emulsion of cod-liver oil.

Snow and Alcohol as a Freezing Mixture. E. Moritz. (*Chem. Zeitung*, December 16th, 1882.) The author has found that a considerable reduction of temperature takes place when snow and alcohol are mixed together, as is shown by the following experiments:—

	Mixture.	Temperature at Starting.	Temperature Produced.
Example 1.	Snow, 73 grams, Abs. alcohol, 77 grams.	+ 4° C.	−30° C.
Example 2.	Snow, 77 grams, Abs. alcohol, 77 grams.	+ 2° C.	−24·2° C.
Example 3.	Snow, 77 grams. Abs. alcohol, 77 grams.	−1° C.; temperature of the room + 6·7° C.	−29·4° C.
Example 4.	Equal parts of snow and ordinary spirits of wine of 96° T.	+ 17·5° C.; which was at the same time the temperature of the room.	−20° C.

Ichthyol. Dr. Unna. (*Chemist and Druggist*, 1883, 172.) A substance so named has been introduced by the author. It is obtained by the distillation of a peculiar bituminous earth, and is of a vaseline consistence, of a greenish colour, and with an unpleasant cabbage sort of smell. It contains 2½ to 10 per cent. of sulphur, and while it is perfectly soluble in a mixture of ether and alcohol, it forms a milky-white emulsion with water. It is especially recommended for application in psoriasis and eczema, and is generally used in combination with vaseline or lard, the ichthyol being in the proportion of 10 to 50 per cent., according to the age of the patient. The following combination is recommended in the *Mon. der prakt. Dermologie* as allaying the itching with promoting a cure in cases

of eczema:—Litharge, 10 parts; boiled with vinegar, 30 down to 20 parts; to which add olive oil, lard, and ichthyol, of each 10 parts.

Preparation of Essence of Rennet. T. Nessler. (*Bied. Centr.*, 1882, 410.) The rennet cut up into small pieces is digested in a flask with 1·5 litre soft water and 80 grams sodium chloride; after being allowed to stand for from twenty-two to twenty-four hours, 0·2 litre alcohol is added, and the liquid is allowed to stand for three weeks. To clear the liquid, small pieces of filter-paper are introduced into the flask and left for some time; to this paper the slimy matter adheres, and is readily removed. One litre of this extract suffices to curdle 4,000 litres milk.

Blue Marking Ink. M. Dorvault. (*Journ. Soc. Chem. Ind.*, 1883, 276.)

Silver Nitrate	4 grams.
Liq. Ammonia	12 „
Sodium Carbonate	4 „
Powdered Gum Arabic	6 „
Cupric Sulphate	20 „
Distilled Water	16 „

Dissolve the silver salt in the ammonia, and the soda, gum, and copper salt in the distilled water, and mix the two solutions.

Vanadium Ink. Dr. Siemens. (*Pharm. Centralhalle*, 1883, 148.) Vanadium tannate was proposed for use as writing ink by Berzelius, because the writing is not affected by acids, but the high price of vanadium salts was a great obstacle to its introduction. Since these salts have been more largely prepared for use in the manufacture of anilin black, and other dyes, vanadium ink is again proposed. The author gives the following formula:—

Tannin	10 grams.
Ammonium Vanadate	0·2 „
Water	200 „
Gum Arabic	6 „

Böttger proposed pyrogallie acid and ammonium vanadate, which yields a blue-black liquid free from any precipitate, as a good ink; however, Dr. E. Geissler found the writing with this ink to change to yellowish brown in a short time. Extract of logwood and ammonium vanadate yield likewise an excellent ink.

Ink. (*Pharm. Zeit. für Russland.*) Peltz recommends the following:—

Extract of Logwood	100 parts.
Lime Water	800 „
Carbolic Acid	3 „
Common Hydrochloric Acid	25 „
Distilled Water	600 „
Gum Arabic	30 „
Bichromate of Potassium	3 „
Distilled Water, enough to make . .	1800 „

Dissolve the extract in the lime-water, in a porcelain or well-enamelled iron vessel, over a steam-bath, with frequent stirring. Add the carbolic and hydrochloric acids, which change the solution from a red to a brownish yellow colour. After half an hour's heating over the steam-bath, set the mixture aside until cold, then strain or filter. Now add the bichromate of potassium and the gum, each separately dissolved in a considerable quantity of distilled water, and finally add enough water to make 1,800 parts.

This ink has a fine red colour, which quickly turns black. It does not corrode steel pens, and, if it dries up, needs only the addition of water.

Cement for Glass. (*Zeitschr. des oesterr. Apoth. Ver.*, 1882, 435.)

Dissolve finely cut caoutchouc, 1 part, in chloroform, 64 parts; add finely powdered mastic, 16 parts, and macerate until dissolved. The cement is applied with a brush. A larger proportion of caoutchouc renders the cement elastic.

Paste for Labels. (*Ibid.*) A paste for labels, suitable for bottles, is made by soaking glue in strong vinegar, then heating to boiling, and adding flour. The paste is very adhesive, and in a wide-mouthed bottle may be preserved without decomposition.

Varnish for Labels. (*Rundschau*, 1882, 686.)

Sandarac	53 parts.
Mastic	20 „
Camphor	1 „
Oil of Lavender	8 „
Venice Turpentine	4 „
Ether	6 „
Alcohol	40 „

Macerate for several weeks, agitating frequently until dissolved, and decant or strain from impurities. The varnish dries rapidly to a colourless, smooth, and glossy layer.

Portland Cements. H. le Chatelier. (*Comptes Rendus*, xciv., 867-869.) The principal constituent of Portland cement, and the most active agent in its setting, is the calcic silicate, Si O_2 , 2 Ca O. This by contact with water produces, among other compounds, a

substance crystallizing in hexagonal plates, and playing the chief part in the hardening of the cement; but the author has not been able to determine its composition. Calcic aluminates and ferrates are also frequently present in Portland cements.

Acid-proof Cement. (*Polyt. Notizbl.*) One part of caoutchouc and two parts of linseed oil are melted together, and the mass thoroughly mixed with sufficient white bole until the proper consistence is obtained. This cement becomes somewhat softer by heat, is not attacked by hydrochloric or nitric acid, and does not readily harden. To facilitate the latter, it may be mixed with one-fifth litharge or red lead.

Furniture Polish. (*New Remedies.*) The following is much used:—

Olive Oil	9 parts.
Oil of Amber, rectified	9 „
Oil of Turpentine	9 „
Tincture of Alkanet	1 „

Mix, and keep in a well-stopped bottle. When using it, pour a little upon a pellet of cotton, apply it lightly to the wood several times, and then rub it dry with a cotton rag. If the polish of the furniture has only faded, it will be entirely restored. Of course, if the surface has been rendered rough, or has been scratched, it must first be restored to its former smoothness.

Silvering Glass. G. Palmieri. (*Gazzetta Chim. Ital.*, xii. 206–209.) The author has studied the reducing action of glycerol on silver salts, and finds that it may be applied technically with advantage to silvering mirrors, both on account of the economy of the process and the facility with which it may be conducted. Details of the process are promised in a future communication.

Caoutchouc Oil as Preventive of Rust. (*Chem. Zeitung*, vi. 477.) An oil is at present brought to the market, under the above name, which has proved really to be efficient in preventing rust, and which has also been adopted by the German army. It only requires to be spread with a piece of flannel in a very thin layer over the metallic surface which is to be preserved, and allowed to dry up. Such coating will afford an absolute security against all atmospheric influences, and will not show any cracks under the microscope after a year's standing. To remove it, the article has simply to be treated with caoutchouc oil again, and washed after twelve to twenty-four hours.

Removal of Fat Stains from Paper. (From *New Remedies.*) Oil or fat stains, even when old, may be removed from paper or similar

fabrics by means of a mixture of benzol and magnesia. Calcined magnesia is mixed with a sufficient quantity of benzol to produce a mass which becomes granular after a while. A little of this mixture is rubbed with the finger upon the stain, and the little granules of magnesia afterwards wiped off. Fresh stains usually disappear entirely, old ones after a short time, particularly if the treatment is repeated two or three times. A great advantage of this method, originally introduced by Hirzel, is this: that it may be used upon the finest kind of paper, and that it scarcely affects printed paper, prolonged contact only rendering the printing paler.

The mixture should be preserved in well-closed glass-stoppered vials.

Extract of Coffee. C. Pavesi. (*Annali di Chim.*, 1882, 225.) The author describes a new method of concentrating and administering the valuable and useful constituents of coffee, as follows:—

Roasted Coffee (best)	. . . . .	1 part.
Refined Sugar	. . . . .	2 parts.
Warm Water	. . . . .	q. s.

The coffee is exhausted, in a convenient displacement apparatus, of all its soluble constituents by means of the warm water; the clear brown percolate is mixed with the sugar and evaporated at a temperature not exceeding 50° C. (122° F.), in a suitable apparatus, to dryness. Finally, it is reduced to powder, and kept in well-closed vessels.

The evaporating vessel should be shallow, so as to present a large surface to the air; or, better still, a vacuum apparatus may be used.

The product is a brownish powder, of a coffee odour, a sweet and slightly bitter, very agreeable taste, and very soluble in cold water. Dissolved in boiling water it yields a very fine cup of coffee.

If made into a paste with tragacanth, it may be formed in tablets, or troches—a very convenient form of use.

Hop Cordial. (*New Remedies*, 1882, 208.)

Hops, Dandelion, Gentian, Chamomile, Stil-		
lingia, Orange Peel	. . . . .	each 2 parts.
Alcohol	. . . . .	64 "
Syrup	. . . . .	16 "
Water	. . . . .	76 "

Champagne Cider. (*Druggists' Circular.*) The following is said to give a fine article:—

Good ripe Cider	. . . .	100 gallons.
Strained Honey	. . . .	3 „
Skimmed Milk	. . . .	4 pints.
Cologne Alcohol	. . . .	3 to 4 gallons.

Mix the honey with the cider, set the mixture aside for a week, and clarify it with the skimmed milk. Then add the alcohol, and after three or four days bottle the cider, using good corks and fastening them with cord or wire. The bottles must be kept in a cool place, lying on their side, for three or four weeks before they are ready for use. Instead of the honey mentioned above, 24 lbs. of sugar may be substituted, and 4 or 5 drachms of Russian isinglass dissolved in water may be employed in lieu of skimmed milk as a clarifier.

Angostura Bitters. (*Druggists' Circular.*)

True Angostura Bark	. . . .	5iv.
Camomile Flowers	. . . .	3j.
Cardamom Seeds	. . . .	5ij.
Cinnamon	. . . .	5ij.
Orange Peel	. . . .	3j.
Raisins	. . . .	1 lb.
Diluted Alcohol	. . . .	2½ gals.

Macerate for one month, then press and filter.

Soluble Prussian Blue. M. V. Demandre (*Amer. Textile Record.*) The usual process for preparing soluble Prussian blue consists in precipitating a ferric salt with an excess of ferrocyanide of potassium, and washing the precipitate on a filter with distilled water until the filtrate begins to show a blue tinge. The precipitate is then dried at a gentle heat. As the manipulation is a long one, the author proposes instead the following rapid and easy process:—

Pure Prussian Blue	. . . .	5 drachms.
Ferrocyanide of Potassium	. . . .	2½ „
Distilled Water	. . . .	sufficient.

Rub the two salts to a fine powder in a mortar, and add from 2 to 4 pints of distilled water, according to strength desired. After half an hour's contact, with occasional agitation, the clear liquor may be decanted or filtered off from the insoluble portions.

Shoe Blacking. (*Zeitschr. oesterr. Apoth. Ver.*, 1882, 435.) Mix rapeseed oil, 1 litre, with syrup, 2·5 kilos., water, 5 kilos., and ivory-black, 5 kilos.; then add slowly, stirring constantly, sulphuric

acid, 2·5 kilos., when the mixture becomes hot and thick; finally, stir in water, 2·5 kilos.

Another formula is as follows:—Mix intimately fine ivory-black, 6 parts; syrup, 28 parts; sugar, 4 parts; fish-oil, 3 parts; and sulphuric acid, 1 part; set aside for eight hours, and stir into the mixture decoction of tan, 4 parts; ivory-black, 18 parts; and sulphuric acid, 3 parts, when the mass may be poured into boxes.

Shoe blacking free from sulphuric acid is made as follows:—Boil extract of logwood, 1 part, and bruised nut-galls, 30 parts, with 25 times their weight of strong vinegar; express the liquid, add copperas, 8 parts, and set aside for twenty-four hours; decant the clear liquid, and add gum arabic, 8 parts; rock candy, 100 parts; and syrup, 80 parts; strain and mix with alcohol, 50 parts; solution of shellac, 40 parts; and finally, powdered indigo, 40 parts.

New Receipt for Preparing Shoe Blacking. E. Heim. (*Journ. Soc. Chem. Ind.*)

Beeswax or Ceresine	90 parts.
Spermaceti	30 „
Oil of Turpentine	350 „

Are melted, and then mixed with—

Borax	10 parts.
Black	20 „
Prussian Blue	10 „
Nitrobenzol	5 „

Tooth Wash. (*New Remedies.*) Tooth washes prepared with soap bark as a base are not injurious to the teeth. The following formulæ are published by Dr. Hager:—

Bennet's Tooth Wash.

Quillaia, in moderately coarse powder	20 parts.
Glycerin	20 „
Diluted Alcohol	q. s.
Oil of Gaultheria	q. s.
Oil of Peppermint	q. s.

Macerate the quillaia with the glycerin and 180 parts of diluted alcohol, and enough of the oils to flavour the mixture, for twenty-four hours, occasionally agitating. Then filter and add enough diluted alcohol to make the product weight 200 parts.

Meyer's Tooth Wash.

Quillaia, in moderately coarse powder	. 50 parts.
Peppermint Water	300 „
Alcohol	300 „

Macerate for a few days, then add—

Cochineal, powdered	1 part.
Peppermint Water	100 parts.
Glycerin	100 „
Oil of Gaultheria	1·5 part.

Again macerate during one day, occasionally shaking. Finally add—

Peppermint Water, enough to make . 1000 parts.

Lastly, filter.

Harmless Hair Dye. A. Naquet. (*Moniteur Scientifique* [3], xii. 880.) Dissolve 100 parts of bismuth in the smallest possible quantity of ordinary nitric acid (about 280 parts). To this liquor add a solution of 75 parts of tartaric acid in water, and then a rather considerable quantity of water to ensure complete precipitation. The whole is then thrown upon a filter, and the residue washed with water until the washings are no longer acid. The magma left on the filter is then put into a dish, and solution of ammonia gradually stirred in until all is dissolved. The magma derived from $1\frac{1}{2}$ kilograms of bismuth will require 0·8 or 0·9 litre of ammonia. To this liquor is added 75 parts of hyposulphite of soda in powder, and when the salt is dissolved the product is filtered and put into bottles. In this state it is ready for sending into commerce, but it is of advantage to add one or two per cent. of glycerin; no addition of alcohol is necessary. The liquid so prepared would contain about 5 per cent. of bismuth. It may be further diluted with water if desired.

The hair or beard when saturated with this liquid acquires after five or six hours a deep chestnut colour. Upon washing the hair this colour disappears, giving place to a delicate flaxen colour. By repeating the operation daily a stage is arrived at when, after passing through all the intermediate shades, the deep chestnut colour remains persistent.

Cosmetic Preparations. (*New Remedies*, February, 1883.)

Rose Bandoline.—Digest 800 grains of tragacanth with 1 quart of rose-water for two days at a gentle heat in a closed vessel. Strain the mixture, and perfume it with oil of rose.

Or, macerate 1 part of quince seed with 40 parts of rose-water for several hours, repeatedly agitating; strain the mixture, and perfume it with oil of rose.

Almond Bandoline.—Prepared like the preceding, except that oil of bitter almonds is used for scenting.

If either of the above are wanted coloured, an ammoniacal solution of carmine may be used.

Brilliantine.—Mix 1 part of glycerin with 3 parts of castor oil and 60 parts of alcohol. Perfume according to taste.

Crème de Mauve.—Mix 1 part of glycerin with 1 part of alcoholic extract of jasmin, and colour with a little fuchsine.

Used to impart gloss to the hair.

Oleolisse Tonique (de Piver).—Dissolve 5 parts of castor oil in 15 parts of alcohol, and flavour with oil of bergamot or oil of Portugal.

Hungarian Cosmetic.—Melt 30 parts of white wax on a water-bath, and add 20 parts of powdered almond soap, and 20 parts of a solution of 1 part of gum arabic in 60 parts of rose-water. Stir the mixture until it cools, and perfume it with 1 part of oil of bergamot, or $\frac{1}{3}$ part of oil of rose.

By adding umber or lamp-black, the mass may be coloured brown or black.

Bay Rum (artificial) :—

Tincture of Bay leaves (1 of bay leaves,	
10 of alcohol)	6 ounces.
Oil of Bay	60 grains.
Borax	1 ounce.
Carbonate of Ammonium	1 „
Rose-water	1 quart.

Extrait Végétal :—

Essence of Vanilla (1 of vanilla, 30 of	
alcohol.)	2 parts.
Extract of Orange Flowers	1 part.
„ Jasmine	1 „
„ Rose	1 „
„ Tuberose	1 „
Alcohol	16 parts.
Rose-water	20 „

Amandine (for softening and beautifying the skin).—Make a syrup from 1 part of sugar and $\frac{1}{2}$ part of water. Mix 8 parts of the syrup with 2 parts of almond soap cream, until a homogeneous mass is obtained, to which is to be added, under constant stirring, 200

parts of almond oil, previously perfumed with 2 parts of oil of bitter almonds, 2 parts of oil of bergamot, and 1 part of oil of cloves.

The mixture of the almond oil with the syrupy mass requires some practice and, particularly towards the end, when the mass becomes stiffer, a considerable expenditure of force.

Almond Soap Cream is prepared by melting 250 parts of pure lard and mixing with the melted fat 100 parts of solution containing 25 per cent. of caustic potash. The latter must be added very slowly, and under constant stirring. When all is added it is gradually allowed to cool, the stirring being continued. It is then transferred to a mortar, and triturated with addition of 6 parts of alcohol and $\frac{1}{2}$ part of oil of bitter almonds, until it is creamy and homogeneous.

Olivine.—Four parts of powdered gum arabic and 12 parts of honey are intimately mixed, and the mixture triturated with 6 parts of Castile soap and with two yolks of egg for every ounce of gum arabic used. To this is gradually added, under continued trituration, a previously prepared mixture of 60 parts of finest olive oil, 2 parts of oil of sesame, 2 parts of oil of bergamot, 2 parts of oil of lemon, 1 of oil of cloves, $\frac{1}{8}$ of oil of thyme, and $\frac{1}{8}$ of oil of cinnamon, and the whole thoroughly triturated until a homogeneous mass results.

Almond Paste.—Sixteen parts of blanched bitter almonds are rubbed to a fine paste, and this is gradually added to an intimate mixture of 30 parts of honey, 15 parts of yolk of egg, 30 parts of almond oil, $\frac{1}{2}$ part of oil of bergamot, and $\frac{1}{2}$ part of oil of cloves.

Rose Milk (Lait de Rose).—One part of finely rasped Castile soap is dissolved, with a very gentle heat, in 4 parts of rose-water; 1 part of white wax and 1 part of spermaceti are next added, and, when they are melted, a strained almond mixture is added, prepared from 16 parts of blanched sweet almonds and 1000 parts of water. The addition must be made gradually and under continuous stirring. Finally, 150 parts of alcohol and 8 parts of oil of rose are thoroughly incorporated with the mixture.

Frangipanni Sachet Powder.

Orris Root, powdered	1500 parts.
Vetiver, powdered	120 „
Sandal Wood, powdered	120 „
Oil of Neroli	2 „
„ Rose	2 „
„ Sandal Wood	2 „
Musk Bag, powdered	20 „
Civet	5 „

Heliotrope Sachet Powder.

Orris Root, powdered	1000 parts.
Rose Leaves, powdered	500 "
Tonka Bean, powdered	250 "
Vanilla, powdered	120 "
Musk	4 "
Oil of Bitter Almonds	3 "

New Receipts for Eau de Cologne. (*New Remedies*, 1882, 252.)

A very pleasant, simple, and readily prepared Cologne may be made by the following formula:—

Oil of Orange Flowers (Neroli)	4 parts.
„ Lavender (Mitcham)	4 "
„ Rosemary	8 "
„ Lemon	8 "
„ Bergamot	16 "
Tincture of Musk	1 "
Acetic Ether	1 "
Water	158 "
Alcohol	800 "

Add the oils, tincture of musk, and acetic ether to the alcohol; then add the water, and set the mixture aside, in glass-stoppered bottles, until it has become perfectly clear and limpid. Draw off the clear liquid, or filter it through paper.

A very superior Cologne may also be prepared thus:—

Oil of Orange Flowers (Neroli), pétale	3 ozs.
„ „ „ „ bigarade	1 "
„ Rosemary	2 "
„ Orange, bitter	5 "
„ Lemon	5 "
„ Bergamot	2 "
Alcohol, deodorized	6 gall.
Water, distilled	q. s.

Dissolve the oils in the alcohol; to five gallons of the mixture add slowly and while stirring enough distilled water to render the liquid very slightly opaque. Then add the reserved gallon, which should render the liquid clear again, and set the mixture aside for several weeks. Finally filter.

Eau de Cologne.—(*New Remedies*, February, 1883.) A very pleasant and refreshing eau de Cologne, much resembling that sold with the trade mark "Springbrunn," may be obtained as follows:—

Dissolve 15 parts of oil of orange-peel, 15 of oil of lemon, and 6 of oil of bergamot in 3,000 parts of finest Cologne spirit. (It is

absolutely necessary that only the purest and finest oils and alcohol be used.)

Also dissolve 1 part of oil of neroli (*pétale*) and 1.5 parts of oil of orange (*petits grains*) in 1,000 parts finest rectified rye spirit.

After standing for five or ten days, both liquids are mixed. It is best to distil the mixture, since the odours are better blended thereby; but it may also be aged by allowing it to stand for a time.

To the distillate are added 2 parts of the finest oil of rosemary, and the liquid then put up in small well-corked vials, which must be kept in a cool, shady place.

Perfumes. A. Vomáčka. (*Rundschau*, 1882, 651.) The author recommends the following preparations as being of excellent quality; the alcohol used should be distilled from wine, except where otherwise directed.

Eau de Brettfeld.—Digest for three days orris root, 230 grams; in spirit of wine 2,000 grams, and add a tincture prepared from spirit of wine, 300 grams; oil of lemon, 70 drops; Turkey oil of rose, 60 drops; oil of neroli bigarade, 70 drops; and musk, 0.15 gram.

Eau de Cologne.—Dissolve oil of orange and oil of lemon, each 15 grams; oil of bergamot, 6 grams, in rectified spirit of wine, 3,000 grams. Also dissolve oil of neroli pétale, 1 gram; oil of neroli bigarade, 1.5 gram, in rectified spirit of rye, 1,000 grams. After five or ten days, mix the two solutions. The fragrance improves by age; but a more delicate odour is produced by distilling the mixture. To the distillate, 2 grams oil of rosemary is added.

Extrait d'Heliotrope.—Dissolve heliotropin, 1 gram, in rectified spirit of wine, 100 grams; the addition of 0.1 gram ambergris renders the perfume more permanent.

Sachet d'Heliotrope.—Dissolve heliotropin, 1 gram, in spirit of wine, 25 grams, and incorporate the solution with granulated orris root, 200 grams; after partial drying in the air, put into suitable bags. Black silk absorbs the odour best and retains it longest; next follow in the order given—blue, red, green, and yellow silk.

Hair Oil Perfumes. A. V. Leitmeritz. (*Pharmaceut. Zeitung*.)

1. Ol. jasmin, 40 grams; ol. caryoph., 1 gram; ol. bergamot, 225 grams; ol. citri cort., 10 gtt.; ol. rosmarini, 6 gtt.; ol. neroli, 25 gtt.; ol. thymi, 1 gtt.

2. Ol. bergamot, 100 grams; ol. citri cort., 30 grams; ol. petit-grain, 10 grams; ol. rosmarini, lavand., citronella, of each 1 gram; musk, $\frac{1}{2}$ gram.

3. Ol. bergamot, 32 grams; ol. citri cort., 1 gram; ol. rosarum, 4 grams; musk, $\frac{1}{2}$ gram.

Another correspondent recommends the following:—

To 1 kilo. of oil add oils of geranium, verbenä, and thyme, of each 2 grams, and musk $\frac{1}{2}$ gram, previously rubbed with 2 grams of white sugar. Digest and filter.

Castor Oil Pomade. (*Pharm. Centralhalle.*)

Castor Oil	.	.	.	.	.	.	630	parts.
Vaseline	.	.	.	.	.	.	170	„
Yellow Wax	.	.	.	.	.	.	100	„

Melt the vaseline and yellow wax together, add the castor oil, and perfume to fancy.

Kefir, a New Milk Ferment. (*Brit. Med. Journ.*, May 12, 1883.)

Whilst, during the last few years, koumiss has been introduced into Western Europe, and even into America, a new drink prepared from cow's milk by a process of fermentation imperfectly understood, is coming into use in Russia. This drink is kefir, and it has for long formed the chief article of diet among the mountaineers in the neighbourhood of Mount Elbruz and Kasbek, in the Caucasus. It forms a thick white fluid, with a faintly acid flavour, said to resemble certain light wines. The mountaineers themselves call it "ghippo." The inhabitants of the plains near the Caucasus, and the Russian settlers, who term it kefir, kifir, or khiafar, make use of it, not for the table, but as a popular remedy for anæmia, struma, gastric catarrh, and chronic bronchitis. According to the *Moscow Medical Gazette*, where a contribution on the subject has recently appeared, Dr. Kern being the author, the preparation of kefir is very simple. The mountaineers make it by filling a bag made of goat-skin with milk, then a tenacious mass, of the size of a walnut, of a material which they term "kefir-seed," and the precise origin of which is unknown, is added to the milk. In a few hours the process of fermentation sets in actively. When prepared in wooden or glass vessels, the kefir tastes better. After a lapse of twenty-four hours a weak kefir is produced; when the process is allowed to continue for three days, the kefir becomes very strong. The source of the ferment is scrupulously concealed by the Caucasian mountaineers, who, with the humour of the English cook who once sold a secret for making "fundied cheese," the "secret" being that the cheese must be fundied after toasting and before the addition of pepper, cannot be persuaded to enlighten strangers to any greater extent than in supplying a small sample of the ferment, in the form

of dry, dark-brown, earth-like masses, but steadfastly refusing to say whence they are obtained. One of these fragments dropped into milk begins rapidly to effervesce, turns milk-white, and assumes the form of a mulberry; then fermentation proceeds at once. If a piece, thus transformed, be dropped into another bowl of milk, it rapidly increases in size, and also causes fermentation. Dr. Kern has carefully examined specimens of this "kefir-seed," which consists chiefly of masses of zooglæa, holding together collections of a bacterium which he calls *Dispora Caucasica*. The yeast-fungus, *Saccharomyces cerevisiæ*, is always found associated with this new germ. "Kefir-seed" retains its vitality after remaining for months in its dry condition. Dr. Kern has a great belief in the future of kefir, which has all the virtues of koumiss, and possesses one great advantage over the latter fluid, in that it is just as good when prepared from cow's as from mare's milk.

The Oleates and Oleo-Palmitates in Skin Diseases. Dr. J. V. Shoemaker. (*Glasgow Medical Journal*, October, 1882. From a paper read before the Medical Society of Pennsylvania.) The author claims to have introduced, for the first time, the use of *chemically true* oleates, in contradistinction to those introduced by Mr. John Marshall in this country, which are here described as simply solutions, and not true oleated compounds. Shoemaker's oleates are prepared by the double decomposition of sodium oleate with solutions of neutral salts, the former being prepared by saponification of oleic acid, with a solution of sodium hydrate. A solution of the sodium oleate in eight parts of water is precipitated by a neutral salt, and the precipitate, washed and dried, is the oleate required. The oleates of mercury, atropia, quinia, and antimony, with their therapeutical action, were considered, and Dr. Shoemaker claimed to have first introduced the oleates of lead and bismuth, in 1879, before the Society. The following oleates were also brought forward and shown for the first time.

1. *Oleate of Zinc*, made by decomposing a sodium oleate with a saturated solution of zinc sulphate, boiling out and drying the precipitate, and reducing it to an impalpable powder. One part of this powder, melted with three of a fatty vehicle, makes a suitable ointment. Zinc oleate is a fine pearl-coloured powder, with a soft soapy feel, very much like powdered French chalk. The very best results are obtained from using it simply as a dusting powder, as in cases of excessive sweating of the feet, hands, or other parts, and in seborrhœa oleosa affecting the face; it is the most reliable remedy

in eczema vesiculosum, in erythema about the groins and axillæ, and in herpes.

2. *Oleate of Copper*, obtained by double decomposition with a saturated solution of copper sulphate. The washed precipitate melted with either 4 or 9 parts of cosmoline, fat, or lard, gives respectively a 20 or a 10 per cent. of oleate of copper ointment. Applied to the unbroken skin the oleate of copper rapidly penetrates deeply into the parts, particularly into the follicles, and will produce slight stimulation; applied to the broken skin it acts as a stimulant, and an insoluble albuminate is formed, which coats over the surface and supplies the place of the abraded skin. This oleate is specially useful in cases of ringworm, the ointment being lightly rubbed in night and morning; the parts should be well washed with soap and water to start with, but afterwards only every ten or twelve days. Epilation is not always necessary in this method of treatment. This ointment is also a useful application for indolent ulcers, warts, corns, and bunions.

3. *Oleate of Aluminum*, prepared by decomposing sodium oleate with aluminum sulphate; the washed precipitate mixed with equal parts of lard gives the ointment the author uses. This ointment is semi-solid, dark brown in colour, and has a most powerful astringent action. It very rapidly checks mucopurulent discharges in eczema. The author also recommends it as a dressing in foul ulcers, abscesses, sinuses, burns, and scalds; in these cases it coagulates albumen, constricts the vessels, and has an antiseptic action.

4. *Oleate of Iron*.—The precipitate thrown down on adding ferrous sulphate to sodium oleate is converted, by boiling, into ferric oleate; and this may either be used pure or made into an ointment with an equal part of a fatty base. "When prepared in the above manner, it occurs in a reddish brown paste, inodorous, leaving a styptic taste, and readily soluble in fats, which hold in combination about 30 per cent. of oxide of iron, forming a powerful and important therapeutic remedy." Used topically, it is non-irritating; applied to an ulcerating surface, it is mildly astringent. The author recommends it for its constitutional as well as its local effects, advising that a small piece should be rubbed into the axillæ and inguinal regions two or three times a day; from its use in this way he reports "excellent constitutional (systemic) results" in those who had a weak pulse, a pale and flabby condition of skin, and deranged digestive organs, unable to bear the ordinary chalybeates. In scrofula also he has used it with marked effect.

5. *Oleate of Arsenic*, obtained by making arsenious chloride by the

cautious saturation of hydrochloric acid with metallic arsenic; the solution thus obtained precipitates the oleate required from the sodium oleate. Twenty grains of this with 1 ounce of a fatty base form the author's ointment, which is soft, yellowish, having no action on the skin except when this is abraded, or in wounds, ulcerating and granulating surfaces, in which conditions it will excite active inflammation and destroy the tissues to some depth. It is of value in lusus, especially the ulcerating variety, and also in the tubercular variety after the parts have been thoroughly scraped. It may be applied also in ulcerating epithelioma, in warts, condylomata, nævi, corns, etc.; opium, belladonna, hyoseyamus, and arnica may be combined with it.

6. *Oleate of Silver* is prepared by precipitating sodium oleate with a saturated solution of silver nitrate, washing the precipitate with boiling water, drying it, and reducing it to fine powder. Of this an ointment may be made; strength, 1 drachm to the ounce. The salt is brownish yellow in colour, the ointment dark brown, soft and pliable. The simple oleate may be sprinkled over old chronic ulcers, old sores, and exuberant granulations, when it will set up a healthy condition in the parts. The ointment coats over an abraded surface by combining with the albumen, and causes contraction of the blood-vessels; it is valuable, in the strength 10–20 grains to the ounce, as an application in erysipelas, a stronger ointment being used at the margin to prevent extension of the disease. It has been used also in superficial lupus, boils, and carbuncles.

The oleates of magnesium, lithium, calcium, antimony, tin, and others, have been prepared by similar processes, but are at present of little therapeutic value.

The author claims for these oleates the following advantages: their deep penetration; their freedom from rancidity; their cleanliness of application; their great economy; and their antiseptic action.

Antiseptic Treatment of Wounds. (From *Chem. and Drugg.*) Carbolic acid, as the sole application in the antiseptic treatment, is somewhat out of favour in some quarters, on account of cases of carbolic acid intoxication which have been observed. Iodoform, which was considered at first to be a most valuable substitute, has also been somewhat discredited by reports of fatal results. It appears, however, in such cases to have been used somewhat recklessly. During the late war in Egypt the English surgeons found that the most reliable provisional, as well as permanent, dressing consisted in the dusting of the parts with iodoform, after thorough

irrigation with a $2\frac{1}{2}$ per cent. solution of carbolic acid, or the application of a solution of chloride of zinc, and subsequent dressing by means of a strip of oil-silk, or what is known as "Lister's protective," and a few layers of gauze or borated lint or cotton. Lücke, of Strasburg, recommends naphthalin, and Dr. Fowler, of Brooklyn, endorses this recommendation in a paper published in the "Proceedings" of the Medical Society of King's County, especially in certain cases, such as the wounds made by operations per vaginam, those in the rectum and oral cavity, and the cavities remaining after extirpation of masses of infiltrated and suppurating lymphatic glands, when the application of chloroform or iodoform would be regarded as unsafe. He uses the naphthalin as a fine powder. After thoroughly disinfecting the wound—if not already aseptic—and surrounding parts with a solution of carbolic acid or chloride of zinc, suturing and making proper provision for drainage, the parts to be dressed are covered with a narrow strip of oil-silk previously dipped in a 1 to 40 solution of carbolic acid, and having a perforation here and there to facilitate the egress of whatever secretions may accumulate beneath it, as well as to permit the vapour of the naphthalin to penetrate to the wound itself. This also serves the purpose of preventing the dressings from adhering upon removal. Over this a roll of absorbent cotton, about half an inch in diameter, previously wrung out of the solution of carbolic acid or chloride of zinc, is disposed as a ring encircling the wound and adjacent surface. Within the space thus isolated powdered naphthalin, about a quarter of an inch in depth, is sprinkled, a dressing of absorbent cotton placed over it, and a muslin roller over all. This dressing is not disturbed until the wound secretions make their appearance through and soil the bandages, or some other indications exist for their removal.

Antiseptic Properties of Carbonic Acid. Prof. H. Kolbe. (*Scientific American*, from *Chemiker Zeitung*.) The first experiment in this direction, made by putting a piece of beef on a plate under a glass bell jar of carbonic acid, was unsatisfactory. Before the end of the week a putrid odour was perceptible, and the parts in contact with the plate, where no carbonic acid could reach them, showed an alkaline reaction.

The results were better when the meat was suspended, so as to hang freely, in a vessel filled with carbonic acid.

The experiment was repeated in apparatus of various sizes. The meat to be preserved was hung on a tinned iron hook that moved along a horizontal iron rod in a cylinder made of sheet tin. On

the bottom of the cylinder was a porcelain dish to catch the dropping liquid from the meat, and in the side of the cylinder, just above the dish, a tubulus was soldered on air-tight, and through it passed a short glass tube connected with a rubber tube for introducing the carbonic acid gas. The rubber tube could be closed quickly and tightly by means of a pinchcock. The cylinder also had a gutter around the top, into which the lid fitted, and which was half full of glycerine. A tubulus was also soldered into the top of the metallic cover, and provided with a glass tube like the lower one.

The glycerine acted like a water seal, and when the vessel was closed, carbonic acid from a Kipp's constant apparatus was passed in by the lower tubulus, and expelled the air through the upper one, which was left open. When nearly all the air may be supposed to have been displaced by carbonic acid, the two rubber tubes are securely clamped.

The first series of experiments were made in winter, the second in the hot months of summer. The cylinder containing the meat stood in the warmest room of the author's laboratory, which being on the south side was exposed to the sun's rays for the greater part of the day, and at noon the temperature rose to 32° C. (90° F.)

Pieces of freshly killed beef, weighing from two to five kilos. ($4\frac{1}{2}$ to 11 lb.), including bone and fat, were used.

A week after the beef had been put in the cylinder of carbonic acid, it could not be distinguished by appearance, colour, or odour from fresh meat. It reacted slightly but distinctly acid everywhere.

After being carefully washed off, it was boiled in water. The broth made from it smelt and tasted just like that from fresh meat, and the meat itself, if not boiled too long, was soft and tender, not stringy.

Meat suspended in carbonic acid for two weeks had the same qualities as the other, except that it looked greyer, but within it was red and juicy. The broth made from it, as well as the meat itself, had a pleasant flavour, and only a very sensitive palate could distinguish a slight difference in the taste of this broth and that from fresh meat. In a few cases the meat as well as the soup had a slightly acid taste, which was completely removed by putting in a very small quantity of carbonate of potash. Meat kept in carbonic acid for three weeks was as good as that left there for two weeks, but was softer than fresh meat, and required less time to cook it, or to obtain good broth.

After being kept in carbonic acid for four or five weeks, the meat was still free from putrid smells, but the broth made from it did not taste as good as fresh *bouillon*.

The experiments were not continued any longer.

From this it will be seen that *carbonic acid* is an *excellent preservative for beef*, which will retain its flavour in it for several weeks.

It is worthy of note that mutton acts quite differently, and after being kept in carbonic acid gas for a week, it begins to have a putrid smell.

Veal does not keep as long as beef. No experiments have been made with game or fowls.

Fish, oysters, and fruit only keep a short time.

This property of carbonic acid to preserve beef a long time will scarcely become of any great practical importance, but may find use where carbonic acid is given out in abundance from the earth. At the Nauheim baths there are dry wells in which almost unlimited quantities of carbonic acid stream forth and are pumped out to be used for making soda water, and for other purposes. It would be worth while to try how long beef could be kept fresh by hanging it on a rope in such a well.

The experiments described give rise to many other queries, such as whether light has any effect on the preservative power of carbonic acid.

The author does not propose to extend his experiments any further, and leaves the field free for others who wish to study the chemical and physiological changes and reactions.

Calx Sulphurata and Sulphide of Calcium. (*New Remedies*, May, 1883.) A peculiar product, obtained by calcining about seven parts of finely-powdered gypsum and one part of powdered charcoal in a covered crucible, has long been used in medicine, and has been officinal in various pharmacopœias. The proportions of gypsum and charcoal vary in the latter between eight and three of the former to one of the latter. Soubeiran advises to mix eight of gypsum, four of lampblack, and enough of a fatty oil to make a mass. Other formulæ prescribe caustic lime and sulphur. The homœopaths prepare it by heating equal parts of finely-powdered oyster-shells and flowers of sulphur for ten minutes to a white heat. One of the old names of this preparation is *Hepar Sulphuris Calcareum*, and this is the name it is known by in homœopathic practice. None of the above processes yields a pure sulphide of calcium (CaS), the product being always contaminated with other substances, either undecomposed gypsum or carbonate of calcium,

or free lime or free carbon. A *pure* sulphide of calcium can be prepared only with some difficulty.

It is not at all necessary that the "sulphide of calcium" used in medicine shall be absolutely pure. All previous reports of the therapeutic effects of the compound are based on the commercial article—chiefly on that made from oyster-shells and sulphur—and the quality of this, though it only consists in part of CaS , has remained tolerably uniform.

The pharmacopœia only wished to recognise the article already in use, and knowing that the ordinary name by which it was known in practice and in trade, viz., sulphide of calcium, was wrong, inasmuch as the preparation contained only about thirty-three per cent. of the pure sulphide, the revisers selected the more correct old name, which expresses only the fact that the compound is prepared from *lime* and contains *sulphur*, "*Calx Sulphurata*" = sulphurated lime. A test was, however, appended to estimate the amount of pure calcium sulphide present, and the lowest limit of percentage was placed at thirty-six.

Perfectly pure sulphide of calcium, if ever introduced into medicine, will have to receive the title "*Calcii Sulphidum*" in the Pharmacopœia.

Whether *calx sulphurata* or *calcii sulphidum* be prescribed in the United States, the patient will always receive the same substance. It is never "mixed" artificially, the admixtures being inevitable in process of preparation. A fair estimate of the good quality of a sample may be obtained from the odour of the substance, which should be that of a sulphydric acid, and should be quite distinct. As a rule a better article has been obtained in the United States from homœopathic manufacturers than from any other source. This is probably owing, at least partly, to the fact that they prepare it more frequently than others, and are thereby enabled to dispense it in a much fresher state.

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CONSTITUTION AND RULES OF THE CONFERENCE.

ALPHABETICAL LIST OF MEMBERS' NAMES AND ADDRESSES.

PROGRAMME OF TRANSACTIONS OF THE CONFERENCE AT SOUTHPORT, 1883,
INCLUDING TITLES OF PAPERS.

THE TRANSACTIONS OF THE CONFERENCE, INCLUDING THE PAPERS READ
AND DISCUSSIONS THEREON.

GENERAL INDEX TO THE YEAR-BOOK AND TRANSACTIONS.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

* * * Authors are specially requested to send the titles of their Papers to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

(Name)

(Address)

as a Member of the British Pharmaceutical Conference.

..... Member

Date

This or any similar form must be filled up legibly, and forwarded to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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 Stephenson, Mr. J. B., 48, Frederick Street, Edinburgh.
 Stephenson, Mr. J. N., High Street, Heckmondwike.
 Stephenson, Mr. S., Llyn-y-mawr, Holywell, Flintshire.
 Sterling, Mr. W., Rose Inn Street, Kilkenny, Ireland.
 Stevens, Mr. P. A., 72, Mansfield Road, N.W.
 Stevenson, Mr. J. C., The Strand, Todmorden.
 Stevenson, Mr. J., 1, Baxtergate, Whitby.
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 Stewart, Mr. D., Albert Street, Kirkwall, N.B. [E.C.

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 Stewart, Mr. J., Watergate, Grantham.
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 Thomas, Mr. R., 38, Linnet Lane, Sefton Park, Liverpool.
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 Thompson, Mr. H. C., 113, Edge Lane, Liverpool.
 Thompson, Mr. J., 11, Aldersgate Street, E.C.
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 Thompson, Mr. L., Coney Street, York.
 Thompson, Mr. L., Lisnaskea, Ireland.
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 Tilsley, Mr. R., Caersws R.S.O., Montgomery.
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 Williams, Mr. W., Llanfyllin.
 Williams, Mr. W., 80, Upper Street, Islington, N.
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- Wilson, Mr. E., Silverdale, Staffordshire.
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 Wing, Mr. Lewis, Chislehurst, W. Kent.
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 Woolley, Mr. Harold, 69, Market Street, Manchester.
 Woolley, Mr. Hermann, Knowsley Street, Cheetham, Manchester.
 Woolrich, Mr. C. B., Uttoxeter, Staffs.
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 Yates, Mr. G. A., Birch Villa, Lees, via Oldham.
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 Yorath, Mr. T. V., Canton, Llandaff.
 Young, Mr. J., 20, High Street, Newport, Mon.
 Young, Mr. J., Folds Road, Bolton.

Young, J. R., F.C.S., Sankey Street, Warrington.
Young, Mr. J. B., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.

NOTICE.

*Members are requested to report any inaccuracies in these lists
by letter, addressed as follows:—*

THE SECRETARY,

BRIT. PHARM. CONF.,

17, Bloomsbury Square,

London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.

The North British Branch of the Pharmaceutical Society of Great Britain.

The Pharmaceutical Society of Ireland.

- ABERDEEN.**—Society of Chemists and Druggists (1839). Mr. A. Strachan, 48, Richmond Street, Aberdeen.
- ARBROATH.**—Chemists' Association (1874). Mr. D. A. Cargill.
- ASHTON-UNDER-LYNE.**—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). Mr. E. Fisher, 106, Stamford Street, Ashton-under-Lyne.
- BIRMINGHAM.**—Midland Counties Chemists' Association (1869). Mr. S. Dewson, 90, New Street, Birmingham. Chemists' Assistants' Association (1868), Birmingham.
- BRADFORD.**—Chemists' Association (1869). Mr. H. G. Rogerson, Bradford.
- BRIGHTON.**—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.
- BRISTOL.**—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.
- COLCHESTER.**—Association of Chemists and Druggists (1845). Mr. W. B. Cordley, Colchester.
- COVENTRY.**—Coventry and Warwickshire Pharmaceutical Association (1877).
- DOVER.**—Chemists' Association. Mr. J. Wilford.
- DUNDEE.**—Chemists and Druggists' Association (1868). Mr. J. Russell, Dundee.
- EDINBURGH.**—Chemists' Assistants' Association. Mr. J. R. Hill.
- EXETER.**—Exeter Pharmaceutical Society (1845). Mr. G. Pasmore, Exeter.
- GLASGOW.**—Chemists and Druggists' Association (1854). Mr. Walter Paris, 83, Stirling Road, Glasgow.
- HALIFAX.**—Halifax and District Chemists and Druggists' Association (1868). Mr. W. C. Hebden, 64, North Gate, Halifax.
- HAWICK.**—Pharmaceutical Association. Mr. Thomas Maben, 5, Oliver Place, Hawick.
- HULL.**—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.
- LEEDS.**—Chemists' Association (1862). Mr. J. Hellowell, 88, West Street, Leeds.
- LEICESTER.**—Chemists' Assistants and Apprentices' Association (1869). Mr. S. F. Burford, Leicester.
- LINCOLN.**—Chemists' Association. Mr. C. F. Gadd, 200, High Street, Lincoln.
- LIVERPOOL.**—Chemists' Association (1868). A. H. Samuel, F.C.S., 145, Upper Parliament Street, Liverpool.
- LONDON.**—Chemists' Assistants' Association. Mr. C. F. Wyatt, 300, High Holborn, W.C.
- MANCHESTER.**—Chemists and Druggists' Association (1853). F. B. Bengier, F.C.S., 7, Exchange Street, Manchester.
- NORTHAMPTON.**—Pharmaceutical Association (1871). Mr. F. A. Ashton, 6, Regent Square, Northampton.
- NOTTINGHAM.**—Nottingham and Notts Chemists' Association (1863). Mr. C. W. Warriner, 135, Union Road, Nottingham.
- OLDHAM.**—Chemists' Assistants and Apprentices' Association (1870). Mr. C. G. Wood, Secretary, Church Institute.
- PLYMOUTH.**—Association of Chemists for Plymouth, Devonport, and Stonehouse (1868). Mr. G. Breeze, Catherine Street, Devonport.
- PRESTON.**—Pharmaceutical Students' Society. Mr. H. Denham, 8, Regent Street, Preston.
- SCARBOROUGH.**—Chemists' Association (1870). J. Whitfield, F.C.S., Scarborough.
- SHEFFIELD.**—Pharmaceutical and Chemical Society (1869). Mr. G. T. W. News-holme, 74, Market Place, Sheffield.
- SUNDERLAND.**—Chemists' Association (1869). Mr. C. Rankin, Sunderland.
- TAUNTON.**—Chemists' Association (1870). Mr. H. Prince, Fore Street, Taunton.
- WOLVERHAMPTON.**—Chemists and Druggists' Association (1874). Mr. W. Y. Brevitt, Darlington Street, Wolverhampton.
- YORK.**—Chemists' Association (1865). Mr. Saml. Scruton, 13, Micklegate, York.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE
FORWARDED TO THE FOLLOWING :—

The Honorary Members.

Libraries.

American Pharmaceutical Association; Chemical Society of London; Ecole de Pharmacie, Montpellier; Massachusetts College of Pharmacy; The Mason's College, Birmingham; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Pharmaceutical Society of Toronto; Pharmaceutical Society of Victoria; Royal Society of London; Société de Pharmacie, Paris; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Arbroath Chemists' Association; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Coventry and Warwickshire Pharmaceutical Association; Exeter Pharmaceutical Society; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester Chemists' Assistants and Apprentices' Association; Liverpool Chemists' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; Northampton Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; Wolverhampton Chemists and Druggists' Association; York Chemists' Association.

Journals.

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; Medical Times and Gazette; The Microscope; Nature; New Remedies; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS :—

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; New Remedies; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; Pharmacist; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

PROGRAMME OF THE PROCEEDINGS
OF THE
BRITISH PHARMACEUTICAL CONFERENCE
AT THE
TWENTIETH ANNUAL MEETING, SOUTHPORT, 1883.

OFFICERS.

President.

Prof. ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S.

Vice-Presidents.

(Who have filled the office of President.)

Prof. BENTLEY, F.L.S., M.R.C.S., London.
H. B. BRADY, F.R.S., F.L.S., F.C.S., New-
castle-on-Tyne.
THOS. B. GROVES, F.C.S., Weymouth.

Prof. REDWOOD, Ph.D., F.I.C., F.C.S., London.
G. F. SCHACHT, F.C.S., Clifton, Bristol.
W. SOUTHALL, F.L.S., Birmingham.
R. REYNOLDS, F.C.S., Leeds.

Vice-Presidents.

M. CARTEIGHE, F.I.C., F.C.S., London.
W. V. RADLEY, Southport.

C. UMNEY, F.I.C., F.C.S., London.
J. R. YOUNG, Edinburgh.

Treasurer.

C. EKIN, F.C.S., London.

Honorary General Secretaries.

F. BADEN BENDER, F.C.S., Manchester.

SIDNEY PLOWMAN, F.I.C., London.

Local Secretary.

WILLIAM ASHTON, Southport.

Other Members of the Executive Committee.

R. CHIPPERFIELD, Southampton.
F. W. FLETCHER, F.C.S., London.
JAMES KERSHAW, Southport.
A. KINNINMONT, F.C.S., Glasgow.
W. A. H. NAYLOR, F.C.S., London.

J. C. C. PAYNE, Belfast.
P. W. SQUIRE, F.L.S., F.C.S., London.
G. S. TAYLOR, F.C.S., London.
J. C. THRESH, D.Sc., F.C.S., Buxton.

Auditors.

J. SPEARING, Southampton.

T. H. SYKES, Southport.

Editor of Year Book.

LOUIS SIEBOLD, F.I.C., F.C.S.

Secretary.

PHILIP PRINCEP.

Local Committee.

ASHTON, Mr. WM., Southport.
ABRAHAM, Mr. A. C., F.C.S., Liverpool.
ABRAHAM, Mr. T. F., Liverpool.
EARNES, Mr. L. P., Preston.
BALL, Mr. GEORGE, Southport.
BLAIN, Mr. WILLIAM, Bolton.
BROWN, Mr. W. SCOTT, Manchester.
CLARK, Mr. JOHN, York.
COTTON, Mr. JOHN, St. Helens.
ELLIS, Mr. GEORGE, Southport.
ELLIS, Mr. G. WADSWORTH, Birkdale.
EVANS, Mr. EDWARD, Liverpool.
FOX, Mr. St. Helens.
FRASER, Mr. J., Liverpool.
GARSIDE, Mr. S. A., Ormskirk.
GREENOUGH, Mr. HUGH, Warrington.
HAMER, Mr. J. A., Churchtown.

HARRISON, Mr. JAS., St. Helens.
HOLDEN, Mr. EDWARD, Shipley.
HORNFALL, Mr. JOHN, Birkdale.
KERSHAW, Mr. JAS., Southport.
LOADMAN, Mr. JAS., Southport.
MAINWARING, Mr. RICHARD, Southport.
MASON, Mr. A. H., F.C.S., Liverpool.
MCKENZIE, Mr. T., St. Helens.
MILLER, Mr. N., Preston.
MOORE, Mr. JOSHUA, Preston.
PHILLIPS, Mr. J., Wigan.
RIGHTON, Mr. JAMES, Southport.
ROUND, Mr. FRED., Southport.
SCOTT, Mr. JOSEPH, Preston.
SHARPLES, Mr. GEO., Preston.
SHERLOCK, Mr. THOMAS, St. Helens.
SIMPSON, Mr. J. G., Preston.

SINGLETON, Mr. R., Preston.
STEEL, Mr. ALEX., Southport.
SCOTT, Mr. E., Southport.
SYKES, Mr. T. H., Southport.
SUMNER, Mr. R. M., Liverpool.
SYMES, Dr., Liverpool.
THOMPSON, Mr. JOHN, Liverpool.
WATERWORTH, Mr. ALFRED, Preston.
WEBSTER, Mr. GEO., St. Helens.
WHITWORTH, Mr. J., Southport.
WILLAN, Mr. WILLIAM, Preston.
WIMPENNY, Mr. J. M., Southport.
WOODCOCK, Mr. JOS., Liverpool.
WRIGHT, Mr. T. D., Southport.
WOOLLEY, Mr. H., Manchester.
YOUNG, Mr. J. R., F.C.S., Warrington.

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE
ASSEMBLY ROOMS, PRINCE OF WALES HOTEL, SOUTHPORT,

ON TUESDAY AND WEDNESDAY, THE 18TH AND 19TH SEPTEMBER, 1883,

Commencing at Half-past Ten a.m. each day.

MONDAY, 17th SEPTEMBER.

The EXECUTIVE COMMITTEE met, according to notices from the Honorary General Secretaries, at 8 p.m., at the Prince of Wales Hotel.

TUESDAY, 18th SEPTEMBER.

The CONFERENCE met at 10.30 a.m., adjourning at 1 p.m.; and at 2.30 p.m., adjourning at 5 p.m.

Order of Business.

Reception of Delegates.
Report of Executive Committee.
Financial Statement.
Report of Treasurer of the "Bell and Hills Library Fund."
President's Address.
Reading of Papers and Discussions thereon.

PAPERS.

1. *Second Report on the Differences between the Essential Oils of Cinnamon and Cassia.* By A. H. JACKSON, B.Sc. M.P.S., F.C.S.
 2. *Bitter Principles of Nerium Odorum: Preliminary Report.* By H. G. GREENISH, F.I.C.
 3. *Report upon the Quantitative Separation of Strychnine and Brucine.* By W. R. DUNSTAN, F.C.S., and F. W. SHORT.
 4. *Report on Tincture of Nux Vomica.* By W. R. DUNSTAN, F.C.S., and F. W. SHORT.
 5. *The Preservation of Medicinal Herbs by Ensilage.* By Prof. QUINLAN, M.D., M.R.I.A.
 6. *The Mullein Plant.* By Prof. QUINLAN, M.D., M.R.I.A.
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Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the Meeting, on invitation of the Local Committee, partook of a Luncheon served in an adjoining room.

During the mid-day adjournment the Local Committee conducted a party of the Members of the Conference to the Winter Gardens and Aquarium, and at 5 p.m. to the Victoria Baths, where a special Swimming entertainment was given.

WEDNESDAY, 19th SEPTEMBER.

An adjourned Meeting of the EXECUTIVE COMMITTEE was held at 9.45 a.m.

The CONFERENCE met at 10.30 a.m., adjourning from 1 p.m., till 2.30 p.m. The whole of the business of the Conference was completed this day by about 5 p.m.

Order of Business.

Reception of Delegates.

Reading of Papers and Discussion thereon.

PAPERS.

7. *Additional Notes on the Bitter Principle of Hymenodictyon Excelsum.* By W. A. H. NAYLOR, F.C.S.
8. *Remarks on Experiments with the Ointment Bases.* By W. WILLMOTT.
9. *Note on the Processes of the B. P. and U. S. P. for the Determination of Hydrocyanic Acid.* L. SIEBOLD, F.I.C., F.C.S.
10. *Iodine in Cod Liver Oil.* By E. C. C. STANFORD, F.C.S.
11. *The Trees yielding Benzoin.* By E. M. HOLMES, F.L.S.
12. *Sesame Oil: Report on its Suitability for Pharmaceutical Purposes.* By M. CONROY, F.C.S.
13. *Sesame Oil: its Suitability for Pharmaceutical Purposes.* By T. MABEN.
14. *The State of Combination in which Morphia exists in Opium.* By D. B. DOTT, F.R.S.E.
15. *Sweet Spirit of Nitre.* By A. C. ABRAHAM, F.C.S.
16. *An Examination of some Samples of Pitch and Asphalt.* By E. DAVIES, F.I.C., F.C.S.
17. *Contribution to the Pharmacy of the Pomegranate.* By L. SIEBOLD, F.I.C., F.C.S.
18. *Scammony: a Novel Adulterant.* By M. CONROY, F.C.S.
19. *Aconitine for Internal Administration.* By T. B. GROVES, F.C.S.
20. *The Composition of Easton's Syrup.* By R. H. DAVIES, F.I.C., F.C.S.
21. *The Odorous Principle of Henbane Leaf.* By A. W. GERRARD, F.C.S.
22. *Suggestions for Combinations of Collodion.* By J. B. BARNES, F.C.S.

Place of Meeting for 1884.**Election of Officers for 1883-84.**

Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the Meeting, on invitation of the Local Committee, partook of a Luncheon served in an adjoining room.

At 5 p.m. a visit was paid to the Glaciarium, when Members had an opportunity of seeing and hearing a descriptive process for making ice.

THURSDAY, 20th SEPTEMBER.

In the morning a considerable party of Members, accompanied by the Local Committee, inspected various Chemical Works at St. Helens.

At 2 p.m. most of the Members of the Conference present accepted an invitation to a Garden Party given by the Local Committee at the Botanic Gardens, Churchtown.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT SOUTHPORT, 1883.

THE proceedings of the Twentieth Annual Meeting of the British Pharmaceutical Conference commenced on Tuesday, September 18th, at the Prince of Wales Hotel, Southport, Professor Attfield, Ph.D., F.R.S., F.I.C., F.C.S., President, in the chair. The attendance of members and friends was larger than on any previous occasion, the capacity of the room set apart for the business of the meeting being taxed to the utmost.

The following members and visitors were present during the meetings :—

Bacup—Sutcliffe, G. H.
Barnsley—Lister, J. H.
Belfast—Payne, J. C. C.
Bentham—Sherlock, Edgar, M.A.
Berlin—Mylius, Dr. Franz.
Birmingham—Percy, Geo. E.
Birkenhead—James, C.
Bishop Auckland—Leigh, John V.
Blackburn—Farnworth, Walter ; Farnworth, William.
Bolton—Forbes, N. ; Harwood, E. G. ; Mason, W. B.
Bootle—Alexander, John ; Wyatt, Harold.
Bournemouth—Worth, E.
Bradford—Waddington, H.
Brighton—Savage, W. W.
Bristol—Schacht, G. F.
Burnley—Hitchin, Robt.
Bury, Lancs.—Siebold, Louis.
Buxton—Thresh, Dr. John C.
Cheltenham—Barrow, W.
Chester—Baxter, Geo. ; Grindley, Wm. ; Williams, Thos.

Clayton-le-Moors—Johnson, Mark.

Dalmuir, N.B.—Stanford, Edwd. C. C.

Droitwich—Taylor, E.

Dublin—Brunker, J. E.; Quinlan, Dr. F. J. B.; Wells, F.; Wells, J.; Wells, W. F., jun.

Eccles—Harland, R. F.; Howie, W. L.

Edinburgh—Dott, D. B.; Stephenson, John; Symington, Thos.; Lee, J. Dickinson.

Farnworth—Watkinson, J. W.

Freshfield—Parry, H.

Giessen—Will, W.

Glasgow—Frazer, Daniel; Nicol, John; Rait, R. A.

Gloucester—Stafford, Wm.

Great Horton—Lister, S.

Halifax—Alexander, Dr. Wm.

Helensburgh—Tocher, Geo.

Heywood—Beckett, W.

Hyam—Wild, Joseph.

Hyde—Curfew, John.

Kilmarnock—Borland, John.

Leicester—Clark, J. W.

Leeds—Fairley, Thos.; Horsfield, John Napier; Jefferson, Peter; Reynolds, F.; Reynolds, Richd.; Ward, Geo.

London—Attfield, Prof.; Attfield, D. Harvey; Bourdas, J.; Butt, Mr. and Mrs. E. N.; Crawshaw, E.; Ekin, C.; Glazier, Walter N.; Hills, Walter; Holmes, E. M.; Ive, W.; Jameson, A. E.; Lewinton, A. B.; Maitland, P. C.; Mortiboy, John; Moss, John; Naylor, W. A. H.; Passmore, F.; Pickard, W.; Piper, W. G.; Plowman, S.; Princep, P.; Robeson, C.; Robinson, R. A.; Rowe, Robt.; Senier, A.; Tanner, A. E.; Taylor, Geo. S.; Williams, John; Williams, T. B.; Williams, T. N.; Williams, M. Whitley; Willmott, W.; Wright, Dr. Alder; Wright, T. R.; —, C. A. P.

Lytham—Hartley, J.; Simpson, Rev. S.

Lincoln—Culwick, H. E.

Liverpool—Abraham, A. C.; Abraham, T. Fell; Billington, Fred.; Burrows, Fred.; Conroy, Michael; Davies, Edwd.; Fraser, Alex.; Gallaway, J. B.; Hocken, J.; Hyman, Alfd.; Johnson, Edwin E.; Mason, Alfd. H.; Samuel, Albt. H.; Sumner, E. L.; Symes, Charles.

Madrid—Jelly, Dr.

Malton—Buckle, Jas.

Manchester—Benger, F. Baden; Butcher, G. S. (Salford); Carter, Wm.; Gibbons, T. G.; Hart, J.; Jackson, Mr. and Mrs. Alfd. H.;

Paine, Alex.; Robinson, Benj.; Twemlow, Richd.; Wheeldon, Jas.; Woolley, Geo. S.; Wilkinson, Wm.

Market Drayton—King, W. G.

Mirfield—Crook, Charles.

New Barnet, Herts.—Young, R. Fisher.

Newcastle, Staffs.—Croydon, E. H.

Oldham—Eckersley, Jas.; Glover, I. S.; Hulme, John; Martin, Anson E.

Ormskirk—Garside, S. A.

Paisley—McMurray, Jas.

Portobello—Nesbit, J.

Preston—Hargreaves, M.

Ramsay, Isle of Man—Laughlin, W.

Reading—Cardwell, E.

Rockferry—Dutton, John.

Royton—Jones, F.

St. Helens—Sherlock, Mr.

Salisbury—Atkins, S. R.

Sheffield—Furness, Jos. M.; Learoyd, E. R.; Newsholme, G. T. W.; Ward, Wm.

Shepton Mallett—Cottrill, Gilbert J.

Southampton—Chipperfield, Robt.

Southport—Ashton, Wm.; Ball, Mr.; Ellis, Geo.; Ellis, G. W.; Hinkley, Ed.; Kershaw, Jas.; Loadman, Jas.; Radley, W. V.; Righton, Jas.; Round, Fred.; Steel, Alex.; Surr, Edwd.; Sykes, T. H.; Taylor, R. E.; Wimpenny, Jas.; Wright, Thos. D.; Whitworth, Jas.

Swansea—Grose, N. M.; Hughes, Jas.

Tarporley—Aston, Walter.

Todmorden—Lord, Chas.

Torquay—Riches, Thos.

Tyldesley—Wallwork, Joseph.

Tynemouth—Atkinson, J.

Walton—Smith, John J.

Warrington—Young, J. Rymer.

Wellington—Butler, J.

Wigan—Phillips, Jonathan; Stothert, Jas.

Yeovil—Maggs, Thos. C.

Yorks—Clark, John; Dresser, Richd.

MEETINGS OF THE EXECUTIVE COMMITTEE.

A meeting of the Executive Committee was held at the Prince of Wales Hotel, Southport, on Monday, Sept. 17th, at 8 p.m.

Present: Prof. Attfield, F.R.S., President, in the chair; Messrs. Ashton, Ball, Kershaw, Naylor, Payne, Schacht, Taylor, and Young; Mr. Ekin (Treasurer), and Messrs. Benger and Plowman (Hon. Gen. Secs.).

The minutes of the previous meeting were read and confirmed.

A draft report of the Executive Committee was submitted by the Honorary General Secretaries, and after discussion and some alterations was adopted. The Treasurer's financial statement was also read and adopted.

The Honorary General Secretaries presented a further report on the correspondence in connection with the suggested appointment of Colonial Secretaries. A number of favourable replies had been received from gentlemen willing to undertake the duties, but the total number was not yet quite complete. It was decided that no definite appointments should be made until the next meeting of the Committee. The Committee, however, desired to express their warm approval of what the Honorary General Secretaries had done.

The place and date of meeting for 1884 were then considered. It was decided that the Conference be recommended to depart from the usual custom of meeting at the same time and place as the British Association in 1884, owing to the latter meeting at Montreal in that year. The invitation which had been received from Aberdeen having been withdrawn, owing to the probable visit of the British Association in 1885, and as only a few days had elapsed since the withdrawal, the Honorary General Secretaries were unable to lay before the meeting any other invitation to the Conference.

A proposed list of officers was discussed, and the further consideration of this was deferred until an adjourned meeting at 9.45 on Wednesday morning.

The manuscript of the *Year-Book*, as far as it could be completed, was laid on the table.

The following 359 ladies and gentlemen were elected to membership:—

Alexander, Mr. G., Liverpool.	Anthony, Mr. J. L., Bedford.
Allden, Mr. J., South Kensington.	Arnfield, Mr. J. C., Ashton-under-Lyne.
Allsop, Mr. J., Oldbury.	Atkins, Mr. J., Bournemouth.
Allwork, Mr. F., Holloway, N.	

- Atkinson, Mr. R., Carlisle.
 Austin, Mr. W., Nechells.
 Babb, Mr. J., Upper Sydenham.
 Bainbridge, Mr. J., Kirkby Stephen.
 Baker, Mr. A. P., London, W.
 Ballard, Mr. A., Faringdon.
 Barker, Mr. A. W., Dalston.
 Barritt, Mr. E. H., Colchester.
 Barry, Mr. F., Shaftesbury.
 Bates, Mr. W., Southampton.
 Beacock, Mr. J. H., Leeds.
 Beale, Mr. J. H., Bournemouth.
 Bearpark, Mr. C. F., Scarborough.
 Beck, Mr. A. N., Hastings.
 Beckett, Mr. W., Heywood.
 Bell, Mr. J. A., Hastings.
 Bentley, Mr. W. J., Tottenham, N.
 Billany, Mr. L. M., Hull.
 Bishop, Mr. E. J., Derby.
 Blackburn, Mr. H. J., Liverpool.
 Blyth, Mr. U., London, W.
 Bourne, Mr. W. K., Lavenham.
 Boutall, Mr. G. S., London, W.C.
 Brabazon, Mr. J. T. P., Belfast.
 Brentnall, Mr. J. E., Middlesborough.
 Brierley, Mr. R., Stalybridge.
 Briggs, Mr. G., Leeds.
 Broomhead, Mr. G. E., Aberdeen.
 Brown, Mr. F. A., Earlestown.
 Brown, Mr. R., Glasgow.
 Buchanan, Mr. D., Kirriemuir.
 Buchner, Mr. M., Whitechapel, E.
 Buckley, Mr. J. J., South Kensington, S.W.
 Bull, Mr. E. J., Clapham, S.W.
 Burdge, Mr. S., Bristol.
 Burnett, Mr. R., Fraserburgh.
 Bunker, Mr. J., Dalston, E.
 Burge, Mr. J. A., Alexandria.
 Burroughs, Mr. G. H., Birkenhead.
 Buxton, Mr. A., Stafford.
 Calvert, Mr. J., Belper.
 Cardwell, Mr. S., Brighouse.
 Carrell, Mr. G., Wimbledon.
 Carruthers, Mr. W., Workington.
 Carter, Mr. F., Carshalton.
 Carter, Mr. R. W., Naas.
 Catterns, Mr. H. P., Camberwell.
 Chapman, Mr. R., Stalybridge.
 Chase, Mr. T., jun., Birmingham.
 Clare, Mr. T., Scarborough.
 Coatsworth, Mr. T., Darlington.
 Cocker, Mr. J. J., Bradford.
 Coleman, Mr. A., Cardiff.
 Collenette, Mr. A., Guernsey.
 Colley, Mr. B., Tipton.
 Cooke, Mr. W., Hodnet.
 Corfe, G., M.D., Brighton.
 Cory, Mr. J. H., Newport, I.W.
 Costerton, Mr. H. A., Brighton.
 Cox, Mr. A., Old Hill.
 Cridland, Mr. F. E. J., London, E.C.
 Cripps, Mr. J., Reepham.
 Crosher, Mr. J., Glasgow.
 Crow, Mr. W. E., London, W.C.
 Cuff, Mr. J. H., junr., London, N.
 Cullen, Mr. H. H., London, N.
 Cullwick, Mr. H. E., Lincoln.
 Cussons, Mr. T. T., Ossett.
 Cutts, Mr. J. N., Mansfield.
 Dalby, Mr. R. E., Monkwearmouthshore.
 Dalwood, Mr. J. H., Sherborne.
 Dampney, Mr. R. S., Kensington, W.
 Davies, Mr. E. C. J., London, N.W.
 Day, J. C. T., Limerick.
 Dennis, J. W., Louth.

- Dickinson, Mr. D., Derby.
 Dickinson, Mr. F., Stamford.
 Dixon, Mr. J., North Kelsey.
 Dixon, Mr. W. H., East Grinstead.
 Dodge, Mr. W., Stockport.
 Doig, Mr. W., Dundee.
 Donaghey, Mr. J. J., Dundee.
 Donovan, Mr. R., Blackrock.
 Downes, Mr. R. J., Dublin.
 Downie, Mr. H., Newcastle-on-Tyne.
 Duncan, Mr. J., Hillhead.
 Dunlop, Mr. J., Hull.
 Dymond, Mr. T. S., Enfield.
 Earnshaw, Mr. B. K., Eastbourne.
 Earp, Mr. J., Melbourne, Derby.
 Eastman, Mr. J. E., Tottenham.
 Eckersley, Mr. J., Oldham.
 Ekins, Mr. A. E., St. Albans.
 Elborne, Mr. W., Manchester.
 Elliott, Mr. R. J., Liverpool.
 Ellis, Mr. T. W., Hull.
 Evans, Mr. E., Woodford.
 Evans, Mr. J., Oswestry.
 Farthing, Mr. T. W., Stoke, Devonport.
 Fazan, Mr. C. H., Turnham Green.
 Ferriday, Mr. E. J. P., Oaken-gates.
 Fielden, Mr. V. G. L., Belfast.
 Fletcher, Mr. T. B., Nottingham.
 Flint, Mr. C. B., Dowanhill.
 Flintan, Mr. F. R., Weybridge.
 Floyd, Mr. J., Bury St. Edmunds.
 Forbes, Mr. W. T., Reigate.
 Ford, Mr. E. B., Pontypool.
 Forewell, Mr. H., Dublin.
 Furness, Mr. J. M., Sheffield.
 Fyvie, Mr. J. G., Coleraine.
 Gabriel, Mr. J. W., London, E.C.
 Galloway, Mr. G. R., Inverness.
 Galloway, Mr. J. B., Liverpool.
 Gamble, Mr. A. G., Grantham.
 Gamley, Mr. D., Edinburgh.
 Garside, Mr. S. A., Ormskirk.
 Gascoigne, Mr. C., Kidderminster.
 Gater, Mr. J., Peckham.
 Geddes, Mr. G., Aberchirder.
 Geddes, Mr. W., Oldham.
 George, Mr. I., Great Yarmouth.
 George, Mr. J. I., Wigton.
 Gibb, Mr. E., New Byth.
 Gibbs, Mr. J., Eastbourne.
 Gibson, Mr. F. J., Wolverhampton.
 Gibson, Mr. J., Manchester.
 Gibson, Mr. J. P., Hexham.
 Gill, Mr. W., Nottingham.
 Gilmour, Mr. G., Kingston, Glasgow.
 Glover, Mr. J. S., Oldham.
 Gloyne, Mr. C. G., Dewsbury.
 Golding, Mr. J., London, N.W.
 Gostling, Mr. J. H., Halesworth.
 Gravill, E. D., F.R.M.S., London, S.E.
 Greaves, Mr. J., Canton, Cardiff.
 Green, Mr. J. H., Frome.
 Greensill, Mr. H. W., Fishponds.
 Haddock, Mr. J., Leigh.
 Haller, Mr. F. W., Skegness.
 Harris, Mr. E. W., Merthyr Tydfil.
 Harrison, Mr. J., St. Helens.
 Harrop, Mr. J. H., London, N.W.
 Harrop, Mr. W. H., Crewe.
 Hart, Mr. T., Glasgow.
 Hartley, Mr. S., Harrow-on-the-Hill.

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| Harvey, Mr. W. B., Frome. | Leitch, Mr. W., Edinburgh. |
| Harwood, Mr. E. G., Bolton. | Litchfield, Mr. J., Longton. |
| Hasselby, Mr. E. H., St. Leonards-on-Sea. | Lloyd, Mr. R., Peny-graig. |
| Henry, Mr. J. P., Belfast. | Lloyd, Mr. R., Claycross. |
| Heslop, Mr. H. H., Kingswinford. | Lucas, Mr. J. M. M., Gravesend. |
| Holmes, Mr. P., Torquay. | Macaulay, Mr. W. H., Huddersfield. |
| Hornby, Mr. A., Richmond, Surrey. | MacDermott, Mr. R. J., Islington, N. |
| Horsfall, Mr. J., Southport. | MacFarlane, Mr. P., Fort William. |
| Huggett, Mr. S., Liverpool. | McGlashan, Mr. J., Edinburgh. |
| Hughes, Mr. J. M., London, S.W. | McSweeney, Mr. M. A., Sunday's Well. |
| Humphry, Mr. H., Dartmouth. | Mackaness, Mr. C., Chesham. |
| Hutcheon, Mr. W., Bonnyrigg. | Machin, Mr. W. G., Hartley Wintney. |
| Insull, Mr. E. S., Hanley. | Madeley, Mr. E. S., London, W. |
| Jackson, Mr. W. G., Hartlepool. | Maitland, Mr. P. C., London. |
| James, Mr. A. W., Sketty. | Maitland, Mr. W., Kemnay. |
| James, Mr. W. G., Hucknall Torkard. | Maries, Mr. D. R., Bootle. |
| Jenkins, Mr. E. E., Beeston. | Marriott, Mr. T. G., Hastings. |
| Jinks, Mr. J., Ironbridge. | Marsh, Mr. W. H., London, N. |
| Johnson, Mr. E. E., Liverpool. | Marshall, Mr. G. T., Morpeth. |
| Job, Mr. A. T., Wimbledon. | Mason, Mr. J., Boyle. |
| Jones, Mr. F., Royton. | Mather, Mrs. E., Haddington. |
| Jones, Mr. J., Willenhall. | Maurice, Mr. J., Plymouth. |
| Jones, Mr. O., Bangor. | Maxey, Mr. W. H., Sheffield. |
| Jones, Mr. T. P., Llanidloes. | Milligan, Mr. W. M., Newton Stewart. |
| Jones, Mr. W. H., Triley Bridge. | Mills, Mrs. A. E., Herne Hill, S.E. |
| Joseph, Mr. A. J., St. Leonards-on-Sea. | Moody, Mr. S. W., Louth. |
| Kendall, Mr. R., Sowerby Bridge. | Moore, Mr. J. W., Hanley. |
| Kerfoot, Mr. T., Manchester. | Morrell, Mr. T., Islington, N. |
| Kermath, Mr. W. R., St. Andrews. | Morris, Mr. J. L., Manchester. |
| King, Mr. W. G., Market Drayton. | Mortiboy, Mr. J., Herne Hill, S.E. |
| Lake, Mr. J. H., Exeter. | Munday, Mr. J., Cardiff. |
| Lakin, Mr. W., Leicester. | Neale, Mr. J., King's Lynn. |
| Lambert, Mr. J., Durham. | Nest, Mr. H., London, S.W. |
| Lancashire, Mr. H., Belfast. | Newey, Mr. J. T., Norwood, S.E. |
| Leete, Mr. S. F., Thrapston. | Nicholls, Mr. R. E., Lee. |

- Nicholson, Mr. J. H., Maxwell-town.
 Padwick, Mr. W. G., Croydon.
 Palmer, Mr. F., Upper Norwood, S.E.
 Parker, Mr. A., Uttoxeter.
 Parkinson, Mr. F. W., Atherstone.
 Parrott, Mr. W. S., Watford.
 Patman, Mr. F. T., Whitehaven.
 Payne, Mr. H., Market Rasen.
 Perry, Mr. E. C., Basingstoke.
 Perry, Mr. W. H., Birmingham.
 Petrie, Mr. J. J., Aboyne.
 Phillips, Mr. C. L., Tredegar.
 Pickard, Mr. W., Notting Hill, W.
 Pickering, Mr. T., Over.
 Pickup, Mr. W., Blackburn.
 Pitchford, Mr. W., Cotham.
 Place, Mr. J., Cambridge.
 Pott, Mr. F. F., Birkenhead.
 Potts, Mr. C., Ilkeston.
 Pottage, Mr. J. C., Edinburgh.
 Prentice, Mr. J., Edinburgh.
 Pridgeon, Mr. W. J., Hawkurst.
 Proctor, Mr. W., Newcastle-on-Tyne.
 Prosser, Mr. J. A., Walkden.
 Rackham, Mr. G., Wenhaston.
 Rae, Mr. J., Newmarket.
 Ransom, Mr. F., Hitchin.
 Ray, Mr. G., Macclesfield.
 Redfern, Mr. J., Cobham.
 Reeve, Mr. F. W., Thorgomindah, Queensland.
 Reynolds, Mr. T., Caerphilly.
 Richards, Mr. J. P., Carmarthen.
 Riches, Mr. T., Torquay.
 Ridge, Mr. J., Wigan.
 Ridley, Mr. A. C., Ipswich.
 Roberts, Mr. J. H., St. Helens, Swansea.
 Roberts, Mr. W. C., Llansilin.
 Robertson, Mr. G., London, E.
 Robeson, Mr. C., Liverpool.
 Robinson, Mr. G., Patricroft.
 Roderick, Mr. T., Pontypool.
 Rodman, Mr. J., Glasgow.
 Rose, Mr. C., New Brighton.
 Round, Mr. F., Southport.
 Salmon, Mr. E. F., Brighton.
 Sambell, Mr. J., Redruth.
 Samuel, A. H., F.C.S., Liverpool.
 Sanderson, Mr. G. C., Manchester.
 Sandwith, Mr. W. H., Pracknell.
 Sangster, Mr. W., Dufftown.
 Sansom, Mr. E., Barrow-in-Furness.
 Satchell, Mr. F., Cronthorne.
 Saunders, Mr. C., Highgate, N.
 Scaife, Mr. S., Manchester.
 Scanlan, Mr. C., Droylsden.
 Seymour, Mr. F. S., Wimborne.
 Sharples, Mr. G., Preston.
 Shillinglaw, Mr. W., Birkenhead.
 Sim, Mr. J., Aberdeen.
 Simpson, Mr. D. O., Heanor.
 Simpson, Mr. R. G., Stowmarket.
 Simpson, Mr. W., Glasgow.
 Slater, Mr. A., New Whittington.
 Smith, Mr. C., London, S.E.
 Smith, Mr. E. M., Weymouth.
 Smith, Mr. J., Clay Cross.
 Smith, Mr. J. D., Norwich.
 Smith, Mr. J. J., Walton.
 Smith, Mr. J. T., Radcliffe.
 Smith, Mr. N., Amersham.
 Smithson, Mr. J., Brighton.
 Sneath, Mr. T. D., Newark-on-Trent.
 Sowray, Mr. R. D., Skelmersdale.
 Stangroom, Mr. A., Whissonsett.

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| Stanley, Mr. H., Leamington. | Turner, Mr. J., Stacksteads. |
| Stanley, Mr. T., Accrington. | Tutton, Mr. J., Stockport. |
| Stapleton, Mr. J., Shepherd's
Bush, W. | Twiss, Mr. W., Hunstanton. |
| Stephenson, Mr. S., Holywell. | Tyrer, Mr. P., London, S.E. |
| Stephenson, Mr. J., Whitby. | Vincent, Mr. P., Walham Green,
S.W. |
| Stevenson, Mr. J. C., Todmorden. | Waddington, Mr. H., Thornton. |
| Stewart, Mr. J., Grantham. | Watson, Mr. S., Hounslow. |
| Stickland, Mr. W. H., Ealing
Dean, W. | Wales, Mr. J. C., Hemsworth. |
| Stones, Mr. W., Manchester. | Waterhouse, Mr. J., Ashton-
under-Lyne. |
| Streater, Mr. J. H., London, S.W. | Webb, Mr. R. C., Wexford. |
| Surr, Mr. E., Southport. | Weston, Mr. G., Sleaford. |
| Swan, Mr. J. W., Bromley. | Wheeler, Mr. C., London. |
| Swire, Mr. J., Halifax. | White, Mr. G., Dudley. |
| Sykes, Mr. H., Moldgreen. | White, Mr. J. F., Leeds. |
| Taylor, Mr. J. B., Bedford. | White, Mr. W. E., Cuckfield. |
| Taylor, Mr. R. E., Southport. | Whitla, W., M.D., L.A.H., Bel-
fast. |
| Taylor, Mr. S., Barrow-in-Fur-
ness. | Whitmore, Mr. W. T., London. |
| Thomas, Mr. J. P., Aberystwith. | Whitworth, Mr. J., Southport. |
| Thomas, Mr. R., Liverpool. | Wiley, Mr. W., Grimsby. |
| Thompson, Mr. A., Putney, S.W. | Williams, Mr. C. E., Great Yar-
mouth. |
| Thompson, Mr. C. J. S., Liver-
pool. | Williams, Mr. W., Islington, N. |
| Thompson, Mr. H. C., Liverpool. | Williamson, Mr. W. H., Man-
chester. |
| Thompson, Mr. J., Liverpool. | Wilson, Mr. E., Silverdale. |
| Thompson, Mr. J. S., Sutton
Coldfield. | Wise, Mr. J. N., Durham. |
| Thompson, Mr. T., Richmond,
Yorks. | Wisken, Mr. R., Herne Hill, S.E. |
| Thomson, Mr. C., Elie. | Woolford, Mr. J., Leeds. |
| Thorp, Mr. J., Heaton Chapel. | Woolley, Mr. G., Leicester. |
| Tilsley, Mr. R., Caersws. | Worfolk, Mr. G. W., Ilkley. |
| Troke, Mr. C., London, E.C. | Wright, Mr. T. D., Southport. |
| Trotman, Mr. A. C., Gloucester. | Yates, Mr. G. A., Lees. |
| Turner, Mr. A., Dumfries. | Yorath, Mr. T. V., Canton,
Llandaff. |

An adjourned meeting of the Executive Committee was held on Wednesday, September 19th, 1883, at 9.45 a.m. Present: Prof. Attfield, F.R.S., President, in the chair; Messrs. Ashton, Chipperfield, Naylor, Payne, Radley, Reynolds, Schacht, Taylor, and

Young; Mr. Ekin (Treasurer); and Messrs. Benger and Plowman (Hon. Gen. Secs.)

A letter was read from Hastings cordially inviting the Conference to meet there in 1884. Mr. Benger moved that the invitation be recommended to the General Meeting for acceptance. The motion was seconded by Mr. Young, and carried unanimously.

A list of proposed officers for 1883-4 was adopted for recommendation to the General Meeting, four vacancies being left for residents in Hastings and St. Leonards.

GENERAL MEETING.

Tuesday, September 18th.

Mr. RADLEY, Chairman of the Local Committee, commenced the proceedings by welcoming the Conference to Southport. He said that the chemists of the town and district had been looking forward to this meeting with great pleasure, and it was their supreme desire that it might be a happy and successful gathering. Their pleasurable anticipations were awakened not only by the interest and instruction to be derived from the various papers and discussions tending to advance those departments of science and art in which pharmacists were most directly interested, but more especially because this meeting afforded the opportunity of making the personal acquaintance of many gentlemen whose names had long been familiar to them, and at their head, Professor Attfield, whose works were well known and appreciated, not only in Great Britain and Ireland, but also on the Continent and in the United States. Southport was a young town, which had grown rapidly, and, as all knew, was not unwilling to make its vitality manifest by a little warfare, but it was not able to boast of any great treasures in the way of arts or manufactures. Their neighbours at St. Helens, however, had kindly come to their aid, and on Thursday morning a visit would be made to some interesting works there. Naturalists would, it was hoped, find various objects of interest in the neighbourhood, and the Winter and Botanical Gardens, Glaciarium, and Baths would help to interest the visitors.

The PRESIDENT, in the name of the visiting members of the Conference begged to thank the members of the Local Committee for their hearty welcome, and to assure them that it was accepted with as much earnestness as it was offered. They considered themselves fortunate in having the opportunity of visiting so thriving and

interesting a town—one which had the great advantage of attracting to its shores and charming boulevards the pleasure-seeking portion of a population of no less than four millions within a radius of forty miles. He would also thank the Committee for the enthusiasm with which the idea of this visit had been received, and he trusted that before the meeting closed the local members would find, by the frankness and fulness with which the visiting members accepted their hospitality, how highly their sympathetic efforts were appreciated.

Mr. F. BADEN BENDER (Honorary General Secretary) then read letters from Mr. Brady and Mr. Greenish, expressing their regret at not being able to be present, and stated that similar communications had been received from Professor Redwood, Messrs. C. B. Allen, J. B. Barnes, J. L. Bullock, T. J. Cutting, H. Davenport, Denzil, A. W. Gerrard, R. W. Giles, H. G. Greenish, T. B. Groves, W. Gulliver, F. J. Hanbury, A. Kinninmont, F. H. Lescher, H. Long, T. Maben, G. H. Makins, W. Martindale, J. Robbins, and C. Umney.

LIST OF DELEGATES.

The following is a list of delegates from various societies, who were present at the meeting:—

From the *Pharmaceutical Society of Great Britain*.—Mr. S. R. Atkins (Vice-President); Messrs. E. N. Butt, W. Hills, W. V. Radley, W. G. Savage, G. F. Schacht, and J. Williams.

From the *North British Branch of the Pharmaceutical Society*.—Mr. J. Nesbit (President); Messrs. J. Borland, D. B. Dott, D. Frazer, J. B. Stephenson, and J. R. Young.

From the *Pharmaceutical Society of Ireland*.—Messrs. J. E. Brunker, F. J. Minchin, J. C. C. Payne, and W. F. Wells, jun.

From the *School of Pharmacy Students' Association*.—Professor Attfield.

From the *Bristol Pharmaceutical Association*.—Mr. G. F. Schacht.

From the *Glasgow Chemists and Druggists' Association*.—Messrs. D. Frazer, E. C. C. Stanford, and J. Nicol.

From the *Leeds Chemists' Association*.—Messrs. George Ward, R. Reynolds, and P. Jefferson.

From the *Liverpool Chemists' Association*.—Mr. J. Woodcock (President); Messrs. E. Davies, C. Symes, and A. C. Abraham.

From the *London Chemists' Assistants' Association*.—Mr. W. A. H. Naylor.

From the *Manchester Chemists and Druggists' Association*.—Messrs. Wilkinson, Robinson, Paine, Benger, Siebold, A. H. Jackson, and Woolley.

From the *Oldham Chemists' Assistants and Apprentices' Association*.—Mr. A. E. Martin.

From the *Sheffield Pharmaceutical and Chemical Society*.—Messrs. J. M. Furness, G. T. W. Newsholme, and W. Ward.

Mr. SIDNEY PLOWMAN (Honorary General Secretary) then read the Report of the Executive Committee, as follows:—

REPORT OF THE EXECUTIVE COMMITTEE.

It is the duty of your Committee in this, their Twentieth Annual Report, to place before the members of the Conference an account of the business transacted by them during the past year.

Beside the ordinary details of administration several questions of great interest to members have arisen, upon which your Committee have had to deliberate on your behalf.

It will be remembered that no decision as to the place of meeting for 1883 was arrived at by the General Meeting of the Conference at Southampton last year, but it was resolved that the selection should be left in the hands of the Executive Committee. The British Association, owing to unforeseen circumstances, was unable to visit Oxford, and had not at that time selected the place in which it would meet in 1883. At a meeting of your Committee in October last year, letters were read from both Oxford and Southport, inviting the Conference to meet in those towns in 1883. As, however, in the meantime the British Association had selected Southport as their place of meeting, and as it is the practice of the Conference to meet in the same town as the British Association, it was unanimously resolved that the Southport invitation be accepted. At the same meeting the question of local arrangements was raised, and the following resolution was passed:—

“That it be a general instruction to the local committees of towns in which the Annual Conference is to be held, that their arrangements, both in respect to the business of the Conference and the entertainment of its members, be approved by the Executive before publication, and that the attention of local committees should be called to the report of the Executive at the Sheffield meeting, in so far as it relates to questions of entertainment.”

At a subsequent meeting of the Executive Committee, in April, 1883, it was decided that the list of subjects for investigation should be revised, and in order to carry this out, it was resolved that a copy should be sent to every member of the Committee inviting suggestions. As a result some subjects were excluded and others added, and the "blue-list" last issued includes those subjects only which possess greater or less special pharmaceutical interest.

At the same meeting the Honorary General Secretaries were instructed to issue to all registered chemists and druggists residing in Great Britain, and to all pharmaceutical chemists of Ireland, not already members of the Conference, a circular prominently setting forth the objects of the Conference, and inviting them to membership. This instruction was carried out in July at a cost of £92 11s. 7*d.* As a result, between 340 and 350 registered chemists have tendered their subscriptions and presented themselves as candidates for membership, and applications continue to arrive almost daily.

As the financial year ends on June 30th, no account of the cost of, or of new subscriptions due to the issue of, the circular is included in the Treasurer's present financial statement.

The result of the distribution of the "blue-list" and other circulars among the pharmacists of some of the colonies has been so encouraging that the question of the desirability of appointing colonial secretaries has been discussed.

It was considered that the objects of the Conference, viz., the advancement of pharmacy and the promotion of brotherly feeling and mutual goodwill, might be best secured by such appointments, and the General Secretaries were instructed to obtain the names of suitable gentlemen in the Colonies and India willing to undertake the duties. The following have been communicated with:—Mr. H. S. Evans, F.C.S., Montreal, for Canada; Mr. W. C. Ross, Trinidad, for the West Indies; Mr. A. Walsh, Port Elizabeth, for the Cape and Natal; Mr. D. S. Kemp, Bombay, for India; Mr. E. Taylor, Brisbane, for Queensland; Mr. H. Shillinglaw, Melbourne, for Victoria; Mr. L. B. Bush, Bathurst, for New South Wales; Mr. A. P. Miller, Hobart Town, for Tasmania; Mr. T. M. Wilkinson, Dunedin, for New Zealand. Sufficient time has not elapsed for replies to be yet quite complete, but so far as they have at present been received they are most favourable. Mr. Kemp advises the appointment of a secretary in each Presidency, instead of one only for the whole of India, and consents to act for Bombay if appointed; but Mr. Evans, in consenting to act for Canada, thinks one secretary sufficient for the whole of the Dominion.

Your Committee have pleasure in reporting that they have been able to accede to three applications for money grants for the purchase of material on which to conduct researches. They are as follow :— £5 to Messrs. Dunstan and Short to investigate the pharmaceutical preparations of nux-vomica, principally in regard to their alkaloidal value; £5 to Messrs. Dunstan and Ransom to further extend the method of alkaloidal extraction with the chloroform-alcohol mixture, to be followed by a further grant of £5 if required; £2 2s. to Mr. W. Elborne to determine the comparative pharmaceutical value of commercial rhubarb.

Reports will be presented at this meeting from Messrs. Greenish and Jackson on subjects for the elucidation of which grants have previously been made, and a first report from Messrs. Dunstan and Short on the preparation of nux-vomica, as well as one on the quantitative separation of strychnine and brucine, will be read at this meeting. Mr. Elborne will present a report on the comparative value of commercial rhubarb at the next general meeting.

Twenty-three papers and reports have been received for the present meeting, but one was of a purely medical character, and was returned to the author as being unsuited for the object of the Conference.

The Bell and Hills Fund, founded by the munificence of Mr. Thomas Hyde Hills, provides for the annual expenditure of £10 for the purchase of books for presentation to the library of the Pharmaceutical Association of the city or town in which the Conference meets from time to time. As Southport has no such association, some difficulty arose as to the gift of books this year. The Local Committee, however, arranged that, if the Executive Committee could make the grant, the books should form the nucleus of a library, and that the Local Secretary of the Pharmaceutical Society of Great Britain, for the time being, should undertake the charge of them and should guarantee their legitimate use. Under these circumstances it was decided that the books be presented, and they are now on the table for the inspection of members.

Mr. Louis Siebold was last October re-appointed editor of the *Year-Book*, and the manuscript, as far as it can be prepared, is now on the table.

Since the last General Meeting at Southampton, 399 candidates have been elected to membership, 20 of whom reside in the Colonies, 14 in Ireland, and 332 of the applications were sent by residents in Great Britain in response to the special circular issued last July.

Mr. EKIN (Treasurer) read the following Financial Statement:—

FINANCIAL STATEMENT FOR THE YEAR ENDING JUNE 30TH, 1883.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1882.	DR.	£.	s.	d.
To Balance in hand		217	8	4
„ Sale of Year-Book by Publishers		24	0	0
„ Sale of Year-Book by Secretary		18	0	0
„ Advertisements, 1880 vol.		0	18	0
„ „ 1881 vol.		8	3	0
„ „ 1882 vol.		90	1	0
„ Subscriptions from Members		658	5	3
July. To Dividend on £250 Consols		3	13	5
1883.				
Jan. „ „ „		3	12	6
		£1024	1	6

	CR.	£.	s.	d.
By Expenses connected with Year-Book:—				
„ Printing, binding, and distributing	£435 15 6			
„ Editor's Salary	150 0 0			
„ Advertising and Publishers' charges	27 9 6			
„ Foreign Journals	4 5 0			
		617	10	0
„ Secretary's Salary (P. Princep)	100 0 0			
„ Printing and Stationery	7 7 6			
„ Sundry Expenses	4 5 8			
„ Postage	47 2 6			
„ Advertising	5 0 0			
„ Expenses of Southampton Meeting	15 14 10			
„ Secretary's Expenses, Southampton Meeting (P. Princep)	5 0 0			
„ Balance at Bank	£221 8 1			
„ Cash in Secretary's hands	0 12 11			
		222	1	0
		£1024	1	6

	£	s.	d.
Assets July 1st, 1883 { Cash in hand	£222	1	0
{ Consols (stock)	250	0	0

The Bell and Hills Fund.

	Dr.	£	s.	d.
1882. To Balance in hand		25	5	0
July. To Dividend on £350 Consols		5	2	10
1883.				
Jan. " " "		5	1	6
		<u>£35</u>	<u>9</u>	<u>4</u>

	Cr.	£	s.	d.
By Purchase of Books for Southampton		9	12	6
„ Balance at Bank		25	16	10
		<u>£35</u>	<u>9</u>	<u>4</u>

		£	s.	d.
Assets July 1st, 1883 {	Cash in hand	£25	16	10
	Consols (stock)	350	0	0

Audited and found correct, { JAMES SPEARING.
T. H. SYKES.

The PRESIDENT moved the adoption of the report, which he said spoke for itself, and showed that the Committee had kept constantly before it the objects of the Conference, viz., the encouragement of original research, and the promotion of good fellowship amongst its members throughout the Greater Britain on which the sun never sets. It would be open to any one to put any questions with regard to it, or to discuss it in any way.

Dr. QUINLAN seconded the motion, and thought the members ought to be much obliged to the gentlemen who had managed their affairs so well.

No questions being asked, the motion was put and carried unanimously.

The PRESIDENT then delivered the following address:—

THE PRESIDENT'S ADDRESS.

THE FUTURE SUPPLY OF DRUGS TO THE PUBLIC.

PART II.—*The Relation of the State to Pharmacy.*

ONCE more I desire to direct attention to the important question of The Future Supply of Drugs to the Public. The one side of that subject, namely, The Relation of Pharmacy to the State, I treated last year in my address to the Members of the British Pharmaceutical Conference assembled at the Nineteenth Annual Meeting, at Southampton. Again honoured with the Presidency of that body, at the Twentieth Annual Meeting, at Southport, I ask for attention to the other side, namely, The Relation of the State to Pharmacy.

I do not now purpose considering the ideal relationship of a State to pharmacy. Nor can I within the limits of an hour's address give even an outline of the actual relationship now existing between every civilized State and the pharmacy of that State. I must confine myself at Southport as at Southampton to the question as to what will be the character and conditions of the supply of drugs, in the immediate future, to the individuals and households of Great Britain; so far as that character and those conditions can be predicated from the character and conditions of the present supply. What pharmacy is doing and can do for the State, in the interests of every individual in the State, I described last year; what the State is doing and can do for pharmacy, in the interests of the public, is what I now desire to consider.

A crisis in pharmacy is fast approaching. The endeavour of the British legislature to provide for the proper supply of trustworthy drugs to the public is being seriously thwarted. The great importance of such a supply is obvious, and in 1868 Parliament enacted that after the end of that year no person should take the title "Chemist and Druggist," and practise under it, unless, after satisfying State Examiners that he was properly qualified, his name was duly enrolled on a State Register. Now, that it was possible for any person probably utterly unqualified and certainly unregistered to act towards the public as a Chemist and Druggist without actually calling himself or using the words "Chemist and Druggist," was not then foreseen. Yet that is exactly what is happening. The practice which has long existed in this country, especially in thinly populated districts, of some general shopkeeper, usually a

grocer, selling two or three common drugs, a practice itself not always harmless, has, within the past five or ten years, developed into the sale of nearly all drugs and medicinal compounds by shopkeepers of all descriptions in nearly all districts. Indeed, in some cases, also increasing in number every year, completely furnished shops, indistinguishable in appearance from those of registered chemists and druggists, are opened by unregistered and unqualified men, who are mere distributors in retail of drugs bought wholesale; men without proper knowledge respecting the dangerous articles they deal in and without any sense of the responsibility of their position. These sham chemists and druggists, and large numbers of the general shopkeepers alluded to, sell everything the properly qualified chemist and druggist sells. The only articles which they are not supposed to sell are the few more virulent poisons scheduled in the Pharmacy Act, the sales of which, however, by the duly qualified man do not make five pounds difference to him in the course of a year.

This condition of things is not only worse than that which the Pharmacy Act of 1868 was intended to remedy, it is very much worse. For to supply such unqualified drug sellers large numbers of so-called wholesale druggists have sprung into existence respecting whose qualifications for the work nothing is known. So that at the present time the public are not only liable to be supplied with untrustworthy drugs because a flaw in an Act of Parliament allows unexamined and unregistered men to practise as chemists and druggists, but because the wholesale druggist supplying such retail vendors may himself be incompetent. Now, from wholesale druggists, men who do not keep open retail shops, the legislature never has demanded evidence of qualification. For, firstly, the old type of wholesale druggist was a man of probity beyond suspicion—and, fortunately for the health of Great Britain, the old firms still exist, many a new one, doubtless, being as good. But, secondly, on the assumption that drugs and compounds are only supplied retail by persons who have given evidence of their fitness to manipulate such potent substances and to judge of their quality as they are sent into the shop from the warehouses of wholesale dealers—the assumption on which, apparently the Pharmacy Act of 1868 was framed—on this assumption any evidence of qualification of wholesale druggists is uncalled-for and unnecessary. Obviously, if all the retailers were qualified, the public would be amply protected. Indeed, considering the number of persons employed in a large wholesale drug house, and the extent to which division of labour is carried in such

an establishment, the supplying of evidence of qualification of all who carry on different responsible operations there is perhaps not practicable. So that if any remedy is to be sought for the serious state of things I am considering—assuming that it exists, and I shall show that it does,—that remedy will scarcely be found in the requiring of evidence of qualification from wholesale druggists. It rather lies in an improvement of the Pharmacy Act as regards the retailers of drugs; but of this more later on. The serious fact for present consideration is, that whereas the law of this country, in view of the welfare of the community, in drug matters, contemplates the retail supply of drugs by properly qualified persons only, that intention is being extensively frustrated. Drugs of nearly all kinds, simple and compound, are being indiscriminately stored and sold by unqualified persons; stored with articles of food and drink, and indeed with nearly all articles required in domestic life; and sold by shopkeepers of nearly every class. Thus, drugs, besides being manipulated and vended by registered chemists and druggists, and sometimes by medical men who cannot in all cases earn a livelihood without turning their surgery into a shop, are stored and sold by barbers, booksellers, chandlers, confectioners, drapers, general dealers, grocers, hairdressers, herbalists, ironmongers, marine-store dealers, oilmen, printers, publicans, stationers, storekeepers, tailors, tobacconists, toy dealers, wine merchants. Many of these shopkeepers are no doubt in a very small way of business; many however are prominent men doing large trades, and too often sell the drugs at cost price as mere baits to catch customers for other, profitable, transactions. Then, as already indicated, besides these drug-sellers admittedly engaged in other trades, there are the sham chemists and druggists, the coloured show-globes in whose windows, and bottles on whose shelves mutely proclaim them chemists and druggists, but who are unregistered and unqualified.

This, I say, is an extremely serious state of things. It is, of course, an unfair and very serious condition for chemists and druggists themselves—men who have fitted themselves for their responsible calling in the manner prescribed by Act of Parliament,—for they are thus, many of them, losing much of their means of living and of the means by which they maintain their wives and families. But it is far more serious for the public.

It is a serious state of things for the public for this chief reason, namely, that whereas purchasers of food are more or less protected from the purchase of bad food by their personal power of judging of the quality of food, purchasers of drugs cannot be protected

from the purchase of bad drugs by any personal power of judging of the quality of drugs. *Caveat emptor* does not apply in the case of drugs, because the purchaser has not the requisite knowledge to enable him to *beware*. Even the aid which purchasers of food can invoke from officials under the Acts relating to adulteration cannot be obtained in the case of drugs, because, amongst other reasons, nature yields drugs which vary much in quality, and only trained chemists and druggists can properly judge of such quality. Analysts *quâ* analysts cannot be sufficiently familiar with the varying natural standards of quality of all the many medicinal articles comprehended under the term *materia medica*—if, indeed, there are any such standards—to throw their official shield in front of the public. From the evils of bad drugs the public cannot protect themselves; they cannot be protected by the machinery of the Food and Drugs Act; they have no control over either the importer of foreign drugs, the grower of indigenous drugs, or the wholesale dealer in or manipulator of drugs; as regards the retail dealer, the machinery for their protection in the Pharmacy Act is incomplete: therefore it is expedient that the machinery for their protection in the Pharmacy Act be rendered complete and effective.

Here let me endeavour to allay any alarm which the use of the word “protection” may excite in the minds of free traders. And I say, first, that where the health of the public is at stake, and where the public cannot protect themselves, an exception to the rule of free trade may be and is allowed. For already the State does not permit free trade in some poisonous drugs. Therefore an exception to the rule of free trade is already allowed in pharmacy, hence this part of the question need not be discussed. It is only necessary to consider where the limit of exception should be fixed. The line is now drawn by the State between some poisons and others. My contention will be, that the line should encircle all poisons. Nearly all drugs are poisons, more or less. Therefore nearly all drugs should be excluded from the area of free trade. But I say, secondly, that the doctrines of free trade do not apply to pharmacy. There cannot well be true freedom of trade where the power of judging of the article traded in or demanded is all and only on one side. It is for this obvious reason that the spirit of free trade has not been and cannot be applied to those avocations commonly termed professions. The inhabitants of civilized countries having desired legal or medical assistance, and well knowing that they were unable to form any immediate judgment on the quality of that assistance, have looked for and obtained external means of protecting themselves from

bad law and bad medicine—means external to themselves. Such communities have required that lawyers, doctors, and others should give some evidence of qualification to official examiners, or have aided professional men to erect certain social barriers, known as etiquette and the power of the cold shoulder, for the exclusion of quacks, charlatans, and other unqualified persons from their ranks. Now, pharmacy is largely a professional avocation. In pharmacy we are on the border line of the commercial and the professional. Pharmacy is partly a trade, partly a profession. The purchase and sale of an ounce of tincture of rhubarb is *per se* a transaction purely commercial. But if the dose is asked, or, say, the best mode of administering the medicine, the transaction assumes a professional character; while the still more important question as to whether the purchaser is supplied with a trustworthy or a worthless article turns entirely on the vendor's professional knowledge—chemical, botanical, and pharmaceutical knowledge. In those subjects of professional knowledge he is educated; in those subjects of professional knowledge he is examined; to the extent to which he possesses that knowledge, to that extent he is a professional man. Trade and profession form the warp and woof of pharmacy, interwoven in every part of the fabric. The doctrines of free trade cannot, I say, be applied to professions. Therefore the principles of free trade cannot be applied to pharmacy. The purchaser of drugs cannot protect himself from the purchase of bad drugs. He is not, himself, in a position of freedom in this matter. Therefore he needs protection by methods external to himself. The most ardent champion of freedom will, I am sure, recognise this principle. The legislature has recognised it, and the public has recognised it, and it has been applied to the practice of pharmacy as to medical and to legal practice, not by excluding unqualified chemists and druggists from practice by a code of etiquette or unwritten social law—for, unfortunately, that method appears to be inapplicable in pharmacy,—but by rendering illegal the use of the name or title “Chemist and Druggist” by unexamined or unregistered men.

The Pharmacy Act of 1868 was, at all events, intended to provide such protection. It has partially failed, because incomplete; failed because, while requiring that chemists and druggists shall be properly educated, it has not prevented the uneducated from palming themselves off as chemists and druggists. The Act practically says sellers of drugs must be properly educated, yet allows uneducated vendors to sell drugs. The failure has arisen from a wrong method of protecting the public having been adopted,—a method which

could not be foreseen to be wrong, but which has proved wrong in the working. The method adopted was that of raising a legal fence around the mere name "Chemist and Druggist;" the method which should, we now see, have been adopted, was that of rendering illegal the retail sale of the simple and compound drugs of the British Pharmacopœia (with certain exceptions) by any but registered Chemists and Druggists, with the saving of all rights, of course, to medical practitioners.

The time has come when, for the welfare of the public, the Pharmacy Act should be rendered efficient. If this be not done, a period will soon arrive when the public, unable, as I have said, to judge of the quality of drugs for themselves, will be deprived—or a great majority will be deprived—even of those external means of protecting themselves which, in most districts, they possess now; that is to say, they will lose the advantage of dealing with duly educated men; for thoroughly and legally qualified druggists will only be found in the more wealthy quarters of cities. A certain proportion of drug vendors will always, for various reasons, qualify themselves. A certain proportion of any class of men are always ready to undergo, voluntarily, a course of special education with its attendant set of examinations. Pharmacists form no exception to this rule. Before compulsory examination was instituted in pharmacy,—that is, before 1868,—about 25 per cent. of the chemists and druggists of this country voluntarily submitted to pretty much the same examination that all who would now call themselves "chemists and druggists" are compelled to pass. And therefore, even if the present tendency for the retail supply of drugs to pass into unqualified hands were allowed to continue, a few well-qualified chemists and druggists would, for various reasons, be forthcoming. These would no doubt place themselves and their shops amongst the wealthier classes in the west ends of towns and in fashionable watering-places, and such classes of the public would thus be duly protected from bad pharmacy. But other classes would be unprotected from the liability to be supplied with bad, weak, or spoilt drugs for daily needs or possibly for critical times when life and death are on the balance. Such a state of things must soon come to pass unless timely legislative action be taken. I say a crisis in British pharmacy is fast approaching.

But before we further consider the question of remedy, evidence must be adduced in support of the assertion that potent drugs are being sold largely in nearly all parts of the country by unregistered persons. Evidence of this kind I have gathered from about two

hundred different districts in England and Scotland—districts fairly representing the whole of Great Britain. I have been supplied with direct evidence, in the form of price lists of all the important drugs in general demand issued to the public by shopkeepers other than registered chemists and druggists, and in the form of statements from competent observers as to the kind and numbers of unqualified traders who vend drugs in the respective localities. Indirect evidence has been given to me in the form of returns showing the depreciation in the value of chemists' businesses, including the cause of that depreciation, during the past five or ten years.

In November last I sent to correspondents in about three hundred districts copies of a letter, the chief paragraphs of which were as follows:—"I desire to show that it is to the direct interest of the public that something should be done to prevent the rapidly increasing sale of drugs by unregistered and incompetent persons—an irregular form of trade which is said to have produced already, or largely contributed to the production of, a seriously depressed condition of retail pharmacy. To this end it is desirable I should have more exact knowledge of the stated depression, and of its extent, than any single individual can at present possess. May I beg you, therefore, in the interest of yourself and your fellow pharmacists, to help me by telling me how far the oft-recurring statement that 'pharmacy is not what it used to be,' is true in your experience. For example, how far, in your judgment, is a business worth less than formerly: how far, in your district, are drugs sold by grocers, drapers, etc., or by unregistered men pretending to be chemists and druggists: what proportion of an average drug business in your vicinity is pure pharmacy as compared with the part that has little or nothing to do with drugs; and is the pharmaceutical portion increasing or diminishing? Do you think that the taking of fewer or more concentrated medicines by patients affects the question; or that the depression in pharmacy is greater than has occurred in most callings of a general business character during the past few years? Can you throw any other light on the matter?"

The correspondents selected were, first, a chemist and druggist in most towns in Great Britain having one or more Members of Parliament, or containing three Members or Business-Associates of the Pharmaceutical Society of Great Britain; second, representative pharmacists whose acquaintance I have made in my visits for twenty consecutive years, to the twenty cities or towns at which the British Pharmaceutical Conference has assembled; thirdly, two or

three different classes of persons not actually engaged in retail pharmacy, but who have daily dealings with retail pharmacists. Of the three hundred correspondents I addressed, about two hundred, either at once or on a second application, sent me full replies to the questions, many offering to contribute any further information that might be desired. The greater portion, indeed practically all the replies were, as might be expected, so far private that while I am at liberty to make public use of the information they conveyed, I am not authorised to give the names or addresses of the writers. I thank them cordially for their help, and I doubt not that were any public inquiry into the relation to each other of the State and Pharmacy to be instituted, by a Royal Commission, by a Committee of either House of Parliament, or by any other authority, the majority of them would be willing personally to substantiate their statements.

Respecting the evidence which price lists afford of the sale of drugs by tradesmen other than druggists, little need be said. Every retail trader who, finding it expedient to hold to the fiction that number one is the first law of nature, proceeds to roll three or four, or, it may be ten or twelve businesses into one, is impelled by convenience to compile, and by policy to publish, a priced list of his many articles of sale. Most householders in this country have probably received many such lists sent to them by way of advertisement. In these lists drugs are commonly included. Every drug in ordinary demand will be found there except the few very powerful poisons scheduled in the Pharmacy Act. Indeed even these are not actually excluded, for, called, not by their own names, but by some fancy title, and classed under the misleading term "patent medicines," even the most virulent poisons are sold by these unregistered persons.

Not only, however, do such price lists afford evidence of the sale of drugs by traders other than druggists, but, the prices quoted showing only a slight trading profit above the wholesale price, the inference is fair that such vendors are as professionally unqualified as they certainly are legally unqualified, that is, unregistered. For a five or ten per cent. profit may, possibly, remunerate the man who is only a trader—indeed who does not aspire to be anything more—such as a grocer or a draper, but is quite inadequate for a duly qualified chemist and druggist, who, in obedience to the demands of the public as expressed in the Pharmacy Act, and to his own sense of what is right, has gone through a proper pupilage in pharmacy, chemistry, botany, and materia medica. As well

might we expect a lawyer to thrive on a five or ten per cent. profit on his stationer's work and his office expenses, or a doctor to flourish on a five or ten per cent. profit on his dispensing work and his surgery expenses. These men must be remunerated for the *brain work* they do for the public; they are *professional* men. The druggist is in part a professional man, and must *pro tanto* be paid for his brain work. (And here, in parenthesis, I may remark that the public never stigmatize a lawyer or a doctor as "a man who gets elevenpence three farthings out of a shilling," although this pseudo-sarcasm would be far more literally true of either of them, if it were founded on the insignificant amount of their office costs or surgery expenses, than it is of the druggist. The public should not so stigmatize the druggist. They should regard the charge for a bottle of medicine as they regard the charge for a legal deed or for a medical prescription, namely, as a fee. For a fee it is, in every professional sense of the word. And in order that the public may be set right in this matter, I strongly recommend druggists to think and speak and write of their charges for medicines as fees. I do not recommend that such a view of the case be thrust on the public; for although persons are accustomed to pay two fees, indeed a whole series of fees, for their law—fees to counsel, to their clerks, to solicitors, and for stamp dues, etc.—they will say they object to pay two fees for their physic, that is, one to the physician and one to the pharmacist, forgetting that that is what they already do when they obtain medicines of a chemist and druggist whose charges and qualifications are commensurate. What I do recommend is, that when occasion arises the public be reminded that that is what they do, and that, at all events, this view of the matter be put forward by the druggist whenever he is stigmatized as an ordinary tradesman desiring more than an ordinary tradesman's profit. The public having demanded, for their own safety, by means of the Pharmacy Acts, that the retail druggist possess professional knowledge, will not knowingly stultify themselves by treating him as a tradesman only. But to resume my argument.) The public recognise the value of professional services, and not only pay professional men commensurate fees, but are only too glad to find such services at their disposal. Were any man setting himself up for a lawyer or a doctor to offer to charge the public only a trader's price of five or ten per cent. profit on his expenses, he would rightly be suspected of having no professional knowledge for disposal. Just so should a vendor of drugs, who charges only a trader's price of five or ten per cent. profit on the

wholesale price of the drugs, be suspected of having no professional knowledge respecting those drugs at his disposal, no such knowledge as those chemists and druggists must possess who are properly qualified according to the Act passed for the safety of the public, namely, the Pharmacy Act. The traders I am now describing charge only a five or ten per cent. profit on the wholesale prices of drugs, therefore they may be rightly set down as not having that knowledge which the public, through the legislature, has decided that chemists and druggists should possess. Unfortunately, the public, while realizing the position in which they stand to men who are wholly professional, as the lawyer or the doctor, do not realize, and perhaps never will quite realize, the position in which they stand to the real chemist and druggist. For the trading side of his work for the public obscures the professional side. The druggist may do something towards inducing those of the public who raise the question, to regard this matter in the proper light, if he habitually term the charge for medicine prepared from a prescription *a fee*, as I have suggested; but probably not a century of endeavour to educate the whole of the public up to this point of treating him as in part a professional man would be quite successful. Where the public cannot judge for themselves respecting the qualifications of a professional practitioner, even to the extent to which they judge in a general way of the position in which they stand to medical or legal practitioners, there the aid of the legislature should step in. The public cannot, as regards pharmacy, judge of the pharmaceutical ability of a vendor of drugs. Therefore the legislature should step in and aid the public by enacting, not only as at present that every man *calling* himself chemist and druggist should be properly educated, but that every man *practising* as a chemist and druggist should be properly educated.

The price lists I have described show, first, that traders whose names are not to be found on the State Register of chemists and druggists *practise* as chemists and druggists. Secondly, they afford presumptive evidence that such traders are not properly qualified. This is a serious state of things for the public welfare, all the more so that the public cannot of themselves detect it.

Moreover, it is a condition of things pervading the whole country. Where the wealthy congregate it is not so obvious; but elsewhere its effect is only too evident, either in the reduction of the number of assistants in a chemist's shop, in the discharge of the one assistant, the conversion of the business into one of another kind, the owner

still remaining on the pharmaceutical register, or in the closing of the shop altogether. Indeed, where one chemist's shop has been opened in either of our many new neighbourhoods, one has probably been closed in the older districts; for while population in Great Britain has increased by nearly eleven per cent. during the past ten years, the number of registered chemists has increased in that time only two per cent. That number was 13,216 ten years ago, last year it was only 13,447. Nay, in view of the fact that some of the chemists and druggists now on the register do not now actually practise pharmacy, it is clear that while the general population has increased, the number of practising pharmacists has probably decreased. Certainly the number has decreased in England, if not in Scotland. What may be the exact significance of annual variations in the numbers on the register cannot perhaps be told until time has removed all who were enrolled by mere declaration before examination became compulsory. The quality of businesses, however—that is, their efficiency for the requirements of the public—has suffered, far more than the number of such businesses. For only too frequently when a druggist's earnings are reduced below the point at which he can afford to keep a qualified assistant, the latter, to earn a living, is impelled to open a small shop somewhere in the neighbourhood and, while earning little from the practice of pharmacy, and probably not more altogether than he formerly received as an assistant, he draws a certain amount of business from his, or some other assistant's, old master, who thereby is brought so much nearer to failure. The new businesses are not all equal in efficiency and general appointments to the old, and the old are depreciated. This action is going on all over the country.

Respecting the kind and numbers of unqualified persons dealing in drugs, the evidence I have received is overwhelming. Of the two hundred and seven replies to my questions, only six state that drugs are *not* sold by unregistered persons in the respective districts, one significantly states “not yet,” fifty-five are either silent on the point, or allude to the old practice of grocers in thinly populated districts selling a few of the commonest drugs, while one hundred and forty-five—seventy-five per cent.—complain more or less bitterly of the serious depreciation in the value of their businesses through the sale of drugs by unqualified and unregistered persons. Without wearying my hearers or readers, I will quote from a few of the letters.

And first, as regards unregistered persons whose shops resemble those of chemists and druggists. Comparatively these are at present

few in number, but quite sufficiently numerous, and increasing in numbers sufficiently fast, to show that the evil exists and that a remedy may fairly be claimed from the governing body of the State both as the guardian of the interests of chemists and druggists, as of all separate classes, and as the guardian of the welfare of the public generally. But to quote single sentences from some of the letters. No. 1. "In this town we have so-called patent medicine shops . . . where everything except poisons is supplied the same as at a chemist's." No. 2. Here is "an open shop to all external appearance and to the eyes of the public as much a chemist's as any other, though the would-be chemist in it is without any qualification whatever." No. 3. Here "there are two men (unqualified) keeping open shops, who sell drugs, and are generally supposed by the public to be ordinary chemists and druggists." No. 4. "Drugs are sold here to a very great extent by grocers and small dealers, but also in several cases by unregistered men whose principal feature of their business is drugs with the allied articles." No. 5. "We have a few persons pretending to be chemists and druggists, who have no qualification." No. 6. "In this not very populous district we have one unregistered man trading as a chemist and druggist." No. 7. "There is a man within fifty yards of my shop carrying on business as a chemist and druggist who is unregistered." No. 8. "Two men, who failed to pass the qualifying examination under the Act, are now in business in spite of the Act, selling everything except the few scheduled poisons." No. 9. "In a population of thirty thousands about two hundred shopkeepers not chemists sell drugs, as well as two unregistered men acting as chemists and druggists." No. 10. "One man pretends to be, that is, has a shop fitted up like, a chemist and druggist." No. 11. In this not very large town "two unqualified persons' shops have coloured globes in their windows, and present such other appearances that the public cannot distinguish between them and those of registered chemists and druggists." No. 12. "There are several unregistered men in this town pretending to be chemists and druggists." No. 13. "One unregistered man pretends to be a dispensing chemist." No. 14. "We have two shops here kept by unregistered persons. They sell everything just as a chemist does. The public cannot distinguish these shops from those kept by qualified men. The windows, etc., are fitted up like ordinary druggists' shops. I know for a fact that each sells not only ordinary poisons, but the scheduled poisons, though they are too wary to be caught." Could any evidence be stronger than that of these

fourteen letters to show that an Act designed for the welfare of the public in a vital matter is being systematically evaded. Here are some twenty-five or thirty cases of persons openly defying the spirit of the Act, and of the clear intention of the legislature and of the State. From the tone of many more of my letters, I gather that this number of cases might be multiplied considerably. And such evasion of the law must grow if not checked.

As for the evidence my correspondents give of the sale of drugs on a large scale by persons who do not openly pretend to have pharmaceutical knowledge, it is too voluminous for more than a glance. I have already given an alphabetical list of twenty distinct classes of shopkeepers, other than druggists, who deal in drugs. This list is compiled from my letters, all of which agree that the drugs are sold at prices from a little below to five per cent. above prime cost, and very frequently as mere decoys, baits, or lures, to entice customers from other shops, and secure them as purchasers of more profitable articles. The prices which the druggist has been in the habit of getting for drugs—and which include payment for his professional knowledge, his special manipulative skill, and his personal guarantee of purity and efficacy—have been pointed out to the public by the traders described, they at the same time drawing attention to their own much lower prices, the inference insinuated being that similar savings (?) would be effected in all other things purchased from them. The unfortunate part of this matter is, I reiterate, that the public cannot, and are never likely to be able to, distinguish between good and bad drugs, or not until the health of the community has seriously suffered, and the livelihood of a large class of respectable citizens has been taken away from them. One writer says that according to the statements of a manager in one of the largest store shops of the kingdom, the drug side of a co-operative store, or store shop, seldom pays *per se*; that even if a loss accrues, the sale of drugs is a cheap advertisement for the rest of the concern; the said manager adding, “Do you suppose we should care for this trumpery return, but that it enables us to say, ‘See what extortioners these chemists are; see for yourself that you save threepence or more out of every shilling by dealing with us.’” Co-operative stores are rightly classed by my correspondent with other non-pharmaceutical shops. Indeed, as regards management, they only differ in being carried on by not less than seven owners, while most druggists’ shops are carried on by one owner. It seems a monstrous anomaly that the law should allow seven or more men to carry on the business of chemists and druggists, and call them-

selves chemists and druggists, without being qualified, while it does not allow a single owner to carry on the business of a druggist and call himself a chemist and druggist without being qualified. And, according to the judges, that is what the present Pharmacy Act allows. It is said that a co-operative store company may even sell poisons if no registered assistant is employed, but a single unregistered shopkeeper must not sell poisons, even though he employ registered assistants. Surely there is one law for the store and another for the shop. I could give scores of quotations like the following: "Grocers, drapers, and others, now sell in this town not only epsom salt, senna, castor oil, etc., but tinctures and other preparations, and, in short, everything but poisons." "Under cover of the patent medicine stamp, poisons such as laudanum, opium paste, and other morphia preparations, are sold here pretty generally by non-pharmaceutical shopkeepers." "So-called wholesale druggists, but who are little more than retailers, supply small outsiders with all drugs, including tincture of opium." "With us the evil of drug selling by non-druggists is growing." "All the small shops here sell packeted goods and paregoric *without opium!*" "Grocers, teamen, and tailors sell so-called patents, packed goods, and proprietary articles as decoys, telling their customers that such things show fair specimens of their prices." "Men other than druggists sell drugs, but the articles I have seen are as low in quality as in price." "At the shops of the drysalters and general dealers in this neighbourhood, there is sold quite commonly, as a remedy for diarrhoea, compound tincture of rhubarb, into which is poured a few drops of laudanum." "At the shops named no doubt the public get supplied with cheap, but, to my knowledge, not with the best drugs."

And now as to the somewhat less direct evidence that "pharmacy is not what it used to be." Only thirteen of the two hundred and seven druggists who replied to my questions could say that pharmacy was as flourishing as ever in their experience. Five of those resided in Scotland, one in the western part of London, and six in the provinces, while the shop of the thirteenth was on one of the smaller islands of Great Britain. One of the provincial six explained that although the chemists of the town were doing as well as ever, they had not increased in number in a period during which the town had increased threefold in population. Only four of the thirteen—four in two hundred and seven—could say that pharmacy was distinctly better than it used to be. Three of the four resided in Scotland, the fourth was the pharmacist of one of our smaller

islands. On the other hand, more than half of the letters afford unquestionable evidence that pharmacists are very much farther off prosperity than they were ten years ago. The President of one of those many Chemists and Druggists' Associations which exist as much, if not more, for the benefit of the public than of the pharmacists, says, "There is much harass amongst the general body of chemists and druggists." Another representative says, "Pharmacy in this district is much injured and much depressed, and calls earnestly for a remedy in the interests of the public, and in common fairness to ourselves." A third, writing from a large provincial town, says, "The chemists and druggists of the town have had a meeting to consider the subject of your note. Nothing but depression and hopelessness was manifested. To say that pharmacy is not what it used to be is to use a ridiculously mild phrase. It bids fair to be wrecked." A fourth, in another part of England, says, "We are suffering great trials here, and must suffer more unless the dealing and working with drugs is restricted to druggists." A fifth, in quite another district, says, "Pharmacy in this neighbourhood has degenerated woefully. In a very few years fourteen druggists have become ten; five had the higher title of pharmaceutical chemist, now I am the only one." A chemist in the southern half of London says, "The sale of drugs by unregistered and outside persons is sapping the foundation of retail pharmacy. Within five hundred yards of my shop drugs are being sold at about two and a half per cent. profit, by four grocers, five oilmen, two herbalists, four hucksters, one saddler, three corn-dealers, one publican, and one ironmonger. . . . For the last six years my returns have steadily fallen one hundred pounds a year. A similar or worse result would be shown by my pharmaceutical neighbours." Of one town of fair size the statement is made that "pharmacy is being obliterated here; we are becoming general dealers." I could give scores of similar quotations.

In answer to my questions as to how far a business is worth less than formerly, one hundred and fifteen of my correspondents put the depreciation at an amount varying from twenty-five per cent. to fifty per cent. in ten years. Many gave me, in confidence, figures which showed that the loss in value was still greater. Businesses in wealthy districts appear to maintain their value chiefly because their scarcity produces a little competition for them. A correspondent, of great experience, says, "Ten years ago a business then returning fifteen hundred or a thousand pounds a year would readily command five hundred or three hundred pounds for goodwill, but now

with difficulty would realize one hundred and fifty pounds. Those with returns below a thousand and above five hundred pounds a year would then fetch two hundred pounds for goodwill, but now are transferred for the mere value of stock and fixtures. Businesses turning over, annually, sums below five hundred pounds a year, were formerly worth a hundred pounds for goodwill; now hundreds of these are in the market quite unsaleable at any price." Another writer of equally wide experience says, "With the exception of one or perhaps two businesses to be found in good towns, all have very materially suffered during the past ten years." A third states that "Businesses in these counties often sell for one-third of what they would have fetched a few years ago, while for many it is difficult to get premiums at all." A chemist in the suburbs of a large city says that "pharmacy is rapidly leaving many suburban druggists. . . . The oilman and grocer and the stores are gradually destroying pharmacy. . . . A blue pill and black draught, lenitive electuary, essences, tinctures, syrups, all kinds of pills, are sold retail at prices for which I could not make the articles properly." A letter from a metropolitan suburb, densely populated, states that "One business here, estimated twenty years ago to be worth three thousand pounds, sold eight years since for seventeen hundred and forty pounds; the disappointed purchaser sold it three years ago for eleven hundred pounds; it has changed hands twice or thrice since; it would now be dear at six hundred pounds. Another business in this great thoroughfare about twenty-two years ago sold for nine hundred and fifty pounds; it was purchased eighteen months ago for five hundred and forty pounds. A neighbour's business was valued three years ago at eight hundred pounds—a well stocked, well kept, double-fronted shop, useful house, good garden—it was sold to a surgeon twelve months ago for three hundred and fifty pounds; its returns are now, perhaps, three hundred pounds a year." A writer in a provincial town of over one hundred thousand inhabitants, says, "I fear my account of pharmacy here would be too gloomy to receive credence. We have to eke out a living by some additional business. Altogether we feel most despondent, and I believe any chemist in the town would make a present of his fixtures to any person taking over his business and liabilities." A druggist in a smaller town writes, "Fifteen years ago an announcement that my business was for sale brought me several offers of five hundred pounds. I had occasion to change my intention. But now I cannot get offers of one hundred pounds." More than half of my correspondents give statements to the same effect.

Much more varied are the answers to the question respecting the proportion which in the respective districts the pharmacy proper, of an average business, bears to the part that has little or nothing to do with drugs; while the responses elicited by the inquiry as to whether the pharmaceutical part of the business is increasing or diminishing in amount are less varied. Only in six cases do my correspondents report an absolute increase in purely pharmaceutical business. Four report an increase in returns but a decrease in profits; they have had to do more work for less wage. Several reporting a decrease both of returns and of profits, yet state that the relative returns from the pharmaceutical as against the non-pharmaceutical part of the business have increased, the explanation being that while some of the pharmaceutical portion has been taken away from them, severe competition has obliged them to relinquish very largely the sale of non-pharmaceutical goods. On the other hand, many having had the sale of drugs taken out of their hands by unqualified traders, have been compelled by the pressure of *res angusta domi*, to cultivate the sale of general goods until they have almost ceased to be chemists and druggists, and have become grocers, oilmen, general dealers, etc. Not a few, indeed, having had their half-professional, half-commercial ground cut from under them by the unqualified and unregistered traders in drugs, and not having the full commercial power and training of their competitors, have lost most of their business, whether pharmaceutical or general. With such a state of things no one will be surprised to learn that different druggists fix the proportion of pharmaceutical to non-pharmaceutical business done in their shops at figures varying from five to ninety per cent. Some describe the amount of their drug sales or general pharmaceutical work as "very little," "small," "very small," "very limited." Others say, "We never see a prescription," "We seldom see a prescription." "I only now make up an average of four prescriptions a week, and I am generally credited with having the best business in the town." "There are four druggists here, and we find that latterly we have dispensed about one prescription per head per week."

Many of my correspondents complain of a special feature of unfairness in the competition to which they are subjected by unqualified traders, namely, that these persons often sell drugs of very inferior quality, probably without knowing it, and that the public, in similar ignorance, as readily purchase the almost if not quite useless stuff, tempted, doubtless, by the lowness of price. Unfortunately, very few of such cases can be touched by the Food and

Drugs Acts. Only in such an instance as paregoric being sold without the chief ingredient of that medicine, because its active principle is one of the substances legally deemed "poisons," does there appear to be any means of checking the practice complained of, a practice not only unfair to the druggist, but detrimental to the health of the public. Public officials sometimes express wonder as to where all the worthless or partially spoilt drugs go that are frequently exposed for sale in the large wholesale markets. My correspondents could, apparently, give information which would satisfy that wonder.

After all this evidence, I think every one will admit the following propositions. First, that pharmacy in this country, here and there in a fairly prosperous state, and nowhere yet actually *in extremis*, is nevertheless in a very seriously depressed condition. Secondly, that the prominent cause of the depression is the loss of trade in drugs of guaranteed quality and loss of professional practice of pharmacy by the responsible qualified and registered chemist and druggist, and the acquirement of trade in drugs of unguaranteed quality by the irresponsible, unqualified, and unregistered trader. As for the professional practice in drugs lost by the qualified druggist, that has not been acquired by the unqualified druggist, and therefore has been lost to the public. Thirdly, and chiefly, this condition of things is seriously prejudicial to the public welfare.

No doubt other minor causes influence the depression. And these must now be noticed shortly. But they do not in any important degree dwarf the main cause just stated.

Thus, respecting the practice of physicians prescribing more concentrated medicines than were administered formerly, only nineteen per cent. of my correspondents think that it affects the question under consideration, twenty-six per cent. think it does not, and the remainder express no opinion. A few years ago this practice bade fair to diminish the druggist's income, he generally charging for prescribed mixtures a professional fee of a shilling or two rather than a trade price, a fee which custom had made dependent on the size of the bottle more than on anything else, a fee therefore, the value of which was in inverse proportion to the state of concentration of the medicine. But pharmacists have never, for that reason, made the matter a subject of complaint. They have rather pointed out the great danger of patients, nurses, and families being in possession of what were often deadly fluids. And the practice has gradually been relinquished. In my letters cases are still cited, however: such as thirty-two powerful doses of prussic acid in a single bottle of

medicine; undiluted tincture of *nux vomica*, or strong solution of strychnia or strong solution of arsenic, in one or two ounce quantities, so many drops to be taken in water. In one instance a whole ounce of prussic acid, enough to poison seven or eight or more people, was ordered for one patient.

Again, persons take less physic than formerly. Children in health are not now dosed weekly, even with brimstone and treacle, and healthy adults do not as a rule periodically dose themselves. Homœopathy and hydropathy have had their influence in this direction. Medical men have ceased to prescribe those complicated combinations of half a dozen or a dozen remedial agents which could scarcely be dispensed elsewhere than in the well-appointed shop of a chemist and druggist. They rely now rather on a few active principles or on the official single compounds of the Pharmacopœia. Some idea of the degree in which fewer drugs, etc., are prescribed than, say fifty years ago, may perhaps be gathered from the fact that in 1830 the cost of drugs per in-patient per annum at one of our large metropolitan hospitals, St. George's, was 16*s.* 5*d.* ; while in 1880 it was less than half that sum, namely, 7*s.* 11*d.* The former figures, however, include sums for leeches, agents now seldom employed.

Speaking of hospitals, there can be little doubt that these and the many other charitable medical institutions supply advice and medicines gratuitously to large numbers of persons who can well afford to pay, not only the medical practitioner for his diagnosis, but the druggist for his physic.

Here is a third minor cause of the depression amongst chemists and druggists. In the place of many of the prescriptions which formerly found their way to the druggist, physicians not unfrequently rely on and recommend proprietary preparations, forgetting, in their laudable anxiety to cure their patients by any or every means at their disposal, that they are thereby not only instructing the public in the art of prescribing for themselves, but also in the art of prescribing drugs which are often procured from neither the doctor nor the druggist; for patients carefully scan prescriptions, read them more easily than patients did fifty years ago, draw their own conclusions respecting those now under consideration, and then consult their grocer's or storekeeper's price lists. This art of self-dosing is further fostered by the advertisers of secret remedies, an art which in the long run is harmful to patient, doctor, and druggist alike, and only indirectly profitable to the twenty different classes of non-pharmaceutical shopkeepers who now deal in such things.

Popular medical books and magazine articles addressed to the public all contribute to the same end. The result ensues that while the public on the whole take less physic than formerly, large numbers of those who do take much medicine, take it in a manner over which neither doctor nor druggist has any control. Not a little of this result is due to what I conceive to be mistaken policy on the part of medical practitioners. Verbally and through the press they never cease denouncing the druggist for compliance with a customer's request to be recommended a simple remedy, a practice commonly called counter prescribing, forgetting that they are thereby not only directing customers away from the druggist, but shutting the doors of their own consulting-rooms to thousands of patients who had they not been thus prevented from seeking advice of the druggist, would have been told by that useful functionary that the case was one demanding treatment by a medical practitioner. Most druggists can tell of many cases in which serious illnesses have probably been prevented and even life saved by their timely recommendation to the person to obtain the aid of a medical man. Besides, if you debar the public from seeking a simple remedy at the druggist's counter, either by medical denunciation or by turning over drug dealing to co-operative stores or to profit-cutting general dealers, you not only do not prevent prescribing by others than medical men—for the public always did and always will prescribe for themselves in their own way, either with or without the aid of a druggist—but you play straight into the hands of the patent-medicine monger, and the maker and distributor of secret remedies; you weaken the pharmacist and the physician; and you do harm to the physic-takers themselves. In the interest alike of pharmacist, physician, and patient, this patent-medicine question needs careful consideration, with a view to reform. Patent medicines may and do contain on the one hand powerful poisons, and on the other useless substances. The well-trained druggist either already knows or can form a shrewd judgment of the nature of these officially stamped articles, and, by timely caution or advice, can prevent much mischief resulting from the careless or ignorant use of a potent remedy, or from a too thoughtless reliance on worthless materials. No other shopkeeper has similar knowledge. The sale of patent medicines should, therefore, be restricted to qualified and registered chemists and druggists. By-the-by, the pseudo-official character or guarantee and implied value given to these articles by the presence on them of "the government stamp" should be removed altogether by the withdrawal of the stamp, a

substitute for the revenue it produces being found in a greatly increased charge for the license to sell patent medicines, and perhaps a charge for a license to sell all other medicines. Such a change would not be unpopular with druggists.

Another minor cause of the depression in pharmacy is found in the fact that many chemists and druggists have thoughtlessly encouraged the purchase wholesale and distribution retail of what are termed packed or packeted goods—be they patent medicines, proprietary preparations, simple or compound drugs, coated pills, or what not—instead of themselves preparing such articles; not foreseeing that they were, so far, transforming themselves from professional men into mere trade agents, and that goods of that kind once established in trade could as easily be dealt in by non-pharmaceutical as by pharmaceutical agents, and would only command agents' profits. Such men also have not foreseen that to the extent to which druggists thrust all trouble and responsibility, whether as regards packeted drugs or any other drugs or compounds, on to the wholesale druggist, who, by the way, may or may not be a competent pharmacist, they not only make mere agents of themselves, liable to lose their agency at any time, but they sap the foundation of retail pharmacy as a separate avocation, destroying its professional part and rendering its trade portion liable to be turned into other trade channels. Worse still, their action, or rather inaction, tends to deprive the public of that safeguard against the supply of bad drugs, which the Pharmacy Acts were designed to afford. This minor cause of pharmaceutical depression will become a major influence unless soon checked. Of course many medicinal preparations always have been and always will be made better and more economically in a large wholesale way than on a small retail scale. These are exceptions. But the majority of such things could be prepared as easily and often more cheaply, if with a little trouble, by the qualified chemist and druggist; and he has only himself to thank to the extent to which, through not taking trouble, or through not working professionally, he may have experienced loss of professional or commercial advantages. He must not blame wholesale dealers for prosecuting a variety of trade he has himself relinquished. Wholesale druggists considering that drugs must pass through their hands, no matter by what agency those drugs are distributed retail, would probably prefer their old and simple rôle, and supply drugs to retail druggists only. But if forced by circumstances to do the retail druggist's duty of packing drugs in retail sized parcels, and to sell them to non-pharmaceutical distributors, the wholesale drug-

gists will, of course, do so with little hesitation. The mischief is that unqualified wholesale dealers may and do start up and perform such work. And we may predict that wholesale grocers and others, finding other dealer's travellers amongst their own shop-keeping customers, will themselves begin to deal in drugs. All of which is not to the advantage either of the public, the medical profession, wholesale druggists or retail druggists. "Drugs for the druggist" is a cry in which each of these four classes of the community, in their own best interests, may unhesitatingly concur. *Pace* haters of monopoly. For certain it is that competition in this over-populated country, and the jealousies and distrust of one another inherent in human nature, and not the least in pharmaceutical human nature, will always prevent the evils of monopoly making headway in pharmacy.

The general depression in trade, especially in agriculture, which has affected this country during the past few years, has of course affected pharmacy. Druggists do not complain of this. But with scarcely an exception, my correspondents state emphatically their opinion that the depression in pharmacy is far greater than in other callings. A want of prosperity, general to the country, is shared by pharmacy; but this is only one of the minor causes of pharmaceutical depression.

During these bad times, too, the proportion of medical men who dispense their own medicines has, I am assured by nearly all my correspondents in England, greatly increased. The reverse appears to obtain in Scotland. Indeed it appears that not unfrequently in consultation cases in which a physician is called in, at all events in the southern half of Great Britain, the prescription of the physician is intercepted by and dispensed by the medical practitioner. It would seem from this as if the old days of the apothecary of past centuries were coming round again. And from what I have previously stated respecting the increasing trade in drugs by grocers and others, it would seem as if the days of the drug-grocer—the parent of the drug-gist, as the latter name implies—were after more than two centuries coming round again. This state of things would be, however, for Old England, not progression but retrogression, not advancement but degradation, not evolution but devolution. *Absit omen!* No, we hope and believe that this condition of pharmacy is only temporary. Besides, the medical man of the present day is one who, while having greater professional knowledge of medicine—that is of diagnosis and therapeutics—than the old apothecary, has less professional knowledge of pharmacy. As a pupil in

medicine he has had too many other subjects to study, and as a practitioner he has too many other matters to occupy his attention, to allow of his possessing the old apothecary's acquaintance with pharmacy, and still less to allow of his having anything like the modern druggist's professional knowledge of pharmacy. And as regards the future, the increasing demands on him in matters, relating to the preservation of health, as well as to those which are ever increasing his power of dealing with disease, will still further remove from him opportunities of studying pharmacy. So that the selling of medicines and raw drugs by medical men, even if it could become sufficiently general, which is not in the least degree likely, would not relieve the public from the difficulties encountered in deserting the druggist. The point to which, however, attention is now more especially drawn, is that the tendency of the medical man to be his own druggist, decreasing up to about ten years ago, has, since that time, increased, and that this increase is one of the minor causes of the depression of pharmacy during the past decade.

Improved sanitation; a more extended knowledge of hygiene; less overcrowding; a more general realisation of the importance of exercise for the body, and of mental and physical recreation generally; a more temperate use of our most seductive stimulating fluid and of those dishes which are nice but not nourishing; the employment of purer water for drinking purposes; a diminished superstitious belief in the therapeutical virtue of inert substances; in short, a better knowledge of the laws of life and of health, have combined to render medical practitioners and drugs and druggists less necessary to the world than they were sixty or seventy years ago. But do the members of the noble profession of medicine, including their half-professional, half-commercial brethren of the fourth estate in medicine, namely, pharmacy, complain of this advancement in knowledge? On the contrary, these very men and others like them—by their researches and discoveries freely communicated to the world through the machinery and periodical literature of the various medical, chemical, and pharmaceutical societies, conferences, and associations—these very men are those who have most largely contributed to this advancement in the wisdom and welfare of mankind, and none glory in it more than they do themselves.

But the labourer for the good of all is at least worthy of reasonable reward when working at his calling. The pharmacist will continue his researches for the well being of his fellow men. When, however, in Great Britain, the State says to him, "It is necessary

that you who deal in drugs should for the welfare of the community be properly trained as an apprentice, be educated, be examined, and be registered," and then, when the druggist has willingly complied with the demand, the State permits untrained, uneducated, unexamined, and unregistered men to deal in drugs, the trained, educated, examined, and registered man rightly feels aggrieved and turns to the State for redress. Let this always be remembered, however, namely, that not only for himself does he seek the remedy. He reminds the State that it was for the protection of the public health that he was required to be educated, examined, and registered, and that it is in the interests of the public far more even than in his own interests that he asks that this protection be saved from being a sham, as well as that it be saved from being a mere handicapping arrangement preventing him from making his way in the race for a livelihood.

Does it never occur to the man who purchases cheap physic at a co-operative store, at a general dealer's, or some other shop, to wonder what disadvantages would result if everybody adopted that course. A very little reflection would suffice to picture a few. In the middle of a night, at a time of sudden and serious illness of one whose life is precious, he will require a certain trustworthy medicine. To possess it he would give ten times the total of the small sums he saved by abandoning his reliable druggist: for excruciating pain or perhaps something worse has to be combated without delay. He does not know at which grocer's or general storekeeper's he could procure the drug, and he questions whether such a vendor would leave a bed to inquire who is knocking at the door, even if the summons were heard at all; moreover, he is not certain he could trust the medicine obtained there. Then may come an all too late regret at the shortsightedness of the policy which ignored the professional skill and ever ready service of the qualified druggist in favour of the cheap but ignorant and unsympathising general dealer. Again, a mother has been tempted to purchase paregoric elsewhere than of a druggist, not knowing that, unless the sale is an illegal one, the article is free from that opium to which, when present in proper proportion, much of the efficacy of the medicine is due. The compound being thus weak, she almost necessarily gets into the habit of giving considerably enlarged doses to her children. Some day there happens to be in the house, by accident, paregoric of proper official strength purchased of a chemist and druggist. The usual large dose is administered. Then, perhaps, all efforts to rouse her child from its deep sleep are un-

availing. But to multiply illustrations where general facts are so palpable is unnecessary. I have already, in my opening remarks, shown why the supply of drugs, when uncontrolled by the State, is seriously prejudicial to the interests of the public. Eliminate special professional knowledge from pharmacy, and let drugs be sold by any or every shopkeeper, and the public will have no guarantee that they are not supplied with drugs fair in appearance to the untrained eye, but worthless to the trained eye of the druggist, drugs which once perhaps were of good quality, but which without altering in appearance have become spoilt by age, medicines weaker than they should be, medicines stronger than they should be, poisonous fluids for external application not properly distinguished from those for internal administration; indeed the public will have no guarantee that they are not supplied with the wrong medicine altogether.

To put the matter still more broadly. Every civilized State has adopted means for ensuring the supply to the public of trustworthy drugs by professionally educated druggists. Such almost universal action would not have been taken had it not been called forth by universal necessity. The necessity is at least as great in Britain as in any country. Indeed that necessity has been partially met even in this country by the enactments relating to pharmacy. But those Acts are working incompletely. The health and welfare of every individual in this land calls for a remedy for that incompleteness.

The nature of the remedy is simple. It has more than once been foreshadowed in the course of this address. It involves no new principle. It consists merely in an extension of the spirit and letter of the existing Pharmacy Act. Under that Act about a score of medicinal substances are deemed poisons within the meaning of the Act, and are to be sold retail, as a rule, only by registered chemists and druggists. *Let that list be considerably extended*, saving all rightful interests of persons who otherwise would be unfairly prejudiced. Let the retail sale in open shop of most of the simple and compound medicines of the British Pharmacopœia be carried on only by qualified druggists. Let the duly educated, examined, and registered druggist alone be permitted to compound the prescriptions of the registered medical practitioner. Is the question asked, "Whence is to come the machinery for giving effect to such an extension?" The present machinery under the Pharmacy Act is ample for the purpose—with perhaps a few improvements in matters of what may be termed pharmaceutical police, for giving better effect to certain sections of the Act, as for instance the

employment of the inspectors under the Food and Drugs Act, or other inspectors, to see that unqualified traders do not infringe the Pharmacy Acts. In sparsely populated districts let drugs be sold by unregistered persons: these acting, however, only as agents, the drugs being contained in duly secured packages bearing the name and address of a registered chemist and druggist who should be responsible for the character of the contents. The parcels post has removed most of the transit difficulties connected with such an arrangement.

But it is no part of my duty in this address to enter further on the political details of practical pharmaceutical legislation. I desire to supply the materials of politics rather than to discuss politics. I have gathered together and furnished information, and have submitted arguments that should satisfy every Englishman that there is a serious breach in the established relationship of the State to one important branch of medicine by which the health and welfare of the State is maintained, that is, to pharmacy. I commend that information and those arguments for serious consideration by members of Parliament, by the press, and by the public. For myself, I have no manner of doubt that could the attention of every thinking man in this nation be gained for one short hour to this present relationship of the State to pharmacy, he would vote for its reform in the direction now advocated.

At the conclusion of the address,—

Mr. KERSHAW (Southport) moved a vote of thanks to the President for his address, which all would agree was a very thoughtful and suggestive one, handling very cleverly a most difficult subject. The first thought which occurred to him was that he should much like it to be put into the hands of every member of Parliament, because if they were to go in for further legislation, there were certain facts there stated which ought to be thoroughly pondered. Probably the best mode of showing their thanks would be to give the address full consideration and deep study. They had been reminded of what pharmacy had been, what it was now, and what it could be. There was no doubt they had fallen on evil times, when pharmacy was passing through a transition period, and things were coming to a crisis. The Act of 1868, though well intentioned, had not done what it ought; it provided for an educated class, but what it intended beyond that remained still to be done. The end to be aimed at was that the public should receive their drugs through that educated class only. The first thing necessary to the

cure of any disorder was a correct diagnosis, and that the President had given them; there might be different views as to how the cure was to be attempted, but in his opinion the only course was that pointed out in the address, viz., to amend the Pharmacy Act, by enlarging the scope of the word "poison," and extending the limits of the schedule. All drugs were poisons if unskilfully used. The abuse of hospitals and dispensaries had been referred to, and there was no doubt that many of the persons who received relief from those institutions were not of the class intended to be benefited. Chemists might perhaps agitate for an improvement in that direction, and ask that out-patients should not receive medicines at dispensaries, but only prescriptions to be dispensed by chemists in the neighbourhood.

Mr. SYKES (Southport) seconded the motion. He thought the address had treated a difficult subject in a most masterly manner, though it had shown pharmacy to be in a more depressed state in some places than he had expected to hear. He hoped the subject would be seriously taken up by all the members.

Mr. MOSS (London) desired to add a word in support of the motion. There was great difficulty in criticising such an address, the materials having been so lavishly collected and presented that it was not easy to pick out any one point for special remark. A number of facts had been brought together for the first time, and so marshalled, that it appeared as if the position taken up must be impregnable to any attack from the outside. When it came to be considered thoughtfully and quietly, as he hoped it would be by all, they might hope that it might be fruitful of suggestion, and that some plan of action might be determined upon which would remove the wheels of the chariot of pharmacy from the rut in which at present they seem to be imbedded.

Mr. ATKINS (Salisbury) remarked that the present address formed a very fitting pendant, giving the other side of the shield, to that presented last year at Southampton. The President then dealt with the trinity of the collection, preparation, and distribution of drugs and chemicals; to-day he had dealt with the relation of the State to pharmacy on one particular point, viz., distribution. He felt that the President had painted the picture in the most sombre tints; he would not say that they were unduly sombre; indeed, in the face of such facts as had been cited, it was difficult to contend that the picture was otherwise than correct; but remembering that the darkest hour of night was nearest the dawn, they would hope for better things before long. At the same time he believed that

some portions of the difficulty were irremediable in themselves. As the President had pointed out, there was an increased knowledge of sanitation on the part of the public, and a decrease in the quantity of drugs administered, and, as his own experience would bear out, another important fact was the large amount of eleemosynary administration of medicine. It was obvious, therefore, that there were many facts to be faced, over which they had no power. There were, however, remedies which might be applied, and, as they were aware, the Council of the Pharmaceutical Society had for some time been at work on an amended Pharmacy Act. It was no longer a question of free trade, but of lawful and justifiable protection. The State wisely demanded education, qualification, examination, and registration, and having done that, those who, having complied with the demand, asked for a fair share of protection were thoroughly warranted in doing so. They might say to the State, "If you will have free trade, have it all round; but if you demand from us education and skill to dispense wisely, then we ask for some professional protection." He was very glad that a man so eminent as the President had taken up this subject, which, if treated by smaller men, might have led to invidious remark. The *res angusta domi* could not be lost sight of, and he was very grateful to the President for what he had said.

Mr. SAVAGE (Brighton) said there was little to say after the exhaustive address of the President, except to consider the difficulties to be contended with in connection with legislation. Most of them knew that amongst members of Parliament were the warmest supporters of the co-operative store movement. Their own registered members were not, perhaps, altogether free from blame in this matter, but they were sometimes placed in a very difficult position. If there were a co-operative store in the immediate neighbourhood it was very difficult to tell a customer a price was 1s. 1½d. for something he could get for 9d. or 10d. It appeared to him that the only way in which legislation could be effected was for every pharmacist, each in his own locality, to endeavour to influence his own representative. In some large towns medical men were adopting a course which must be very detrimental to chemists, for he had seen notices exhibited, "Medicine and professional advice, 6d.; if the patient is visited at his own house, 1s." What could a chemist do against that? He knew a case of two brothers, one of whom kept a co-operative store, and the other advertised that if any one ordered drugs to the extent of £1, he would allow 5 per cent. off the store prices.

Dr. QUINLAN (Dublin) said he might say a word as to the way in which pharmacy was conducted in Ireland. At the beginning of this year the Government addressed a communication to the professors of King's and Queen's Colleges, asking them to send in suggestions for an amended schedule to the Pharmacy Act. A Committee, of which he was a member, was appointed to deal with the matter, and a list was sent in containing a number of things which were poisons of the most deadly character; but in reply a letter was received from the Under Secretary saying that the addition of these things to the schedule would interfere with the course of trade and manufactures. The reply of the Committee was that dangerous articles ought to be sold only by men who knew what they were selling, and who could advise their customers upon them; and the Committee insisted on the schedule, but was not able to carry it. His experience was that in Ireland anybody sold medicines who liked, but they did not, as yet, compound medicines, and the co-operative stores did not compound prescriptions; in fact, with regard to medicines, the Irish public seemed to prefer the apothecary or pharmaceutical chemist, perhaps because the co-operative stores had no right to sell and did not open on Sundays. With regard to hospitals and dispensaries, if time permitted he could say a great deal. He had seen a nurse come to a hospital, and when asked where she lived, she gave the address of a man who was certainly worth a thousand a year. He had seen a patient brought to a hospital in a brougham, the property of the family; in fact, he could easily occupy half an hour with tales of the way in which the physician, apothecary, and chemist were robbed. There was a great deal in what had been said about the reduction in the quantity of drugs taken; the days of drugging and drenching were over, and physicians did not use more than one-third the quantity of drugs they did formerly. A great deal of mischief was done also by the sale of ready-made pills, which were sent out with little treatises accompanying them, stating they would cure almost anything, and he feared that some of his brethren did a great deal of harm by prescribing these things. The public would soon learn to get them for themselves and prescribe them for their friends, and would forget to call and pay a fee to the doctor, who originally recommended them. He quite agreed with the President that the chemist was a professional man, and he had so described him in one of his papers. It was impossible for a man to practise as a pharmaceutical chemist without having had a good general education to begin with, and a special technical education superadded to it, and

it was absurd to esteem such a man as a mere retail tradesman, or to suppose he was to receive only 5 or 10 per cent. on the price of his wares.

Mr. YOUNG (Edinburgh) said it was not usual to criticise an address of this kind, but he could not sit still without expressing his approbation of all that had been said as to the condition in which pharmacy stood at present. It appeared that Scotland had suffered less from the changes which had taken place during the last ten years, than other localities; whether that arose from the Scotch habit of self-reliance, he did not know; but his own experience was that they were no worse off than before. This might arise in some measure from the increased education medical men received, which induced them to hand over their dispensing to a chemist. He thought the time was come when something should be done in the direction the President had indicated, if it could be done so as to include a larger number of drugs in the schedule. At the same time the present was an age when free trade had such a hold of the public mind that there would be great difficulty in obtaining what they required. It would depend very much on the manner in which pharmacists stood shoulder to shoulder, and endeavoured to impress the public and members of Parliament with the fact that they did not seek their own advantage only, but the welfare of the public.

Mr. FRAZER (Glasgow) said that if he did not accept all the views enunciated, he could still thank the gentleman who had put them forward so clearly. Professor Attfield, with his usual clearness, had put forward his view of a very difficult question, and those who differed from him totally on this question would be glad to have before them the very clearest and fullest exposition of those views.

Dr. SYMES (Liverpool) also desired to thank the President for the able manner in which he had collected so many facts bearing on the question, though he could not altogether agree with all the deductions drawn from them. His experience was that the public took more medicine than they used to; and it was now much more the custom than it used to be to call in a physician for little ailments in a family. Altogether, he felt very thankful to the President for the facts he had collected, but he hoped the case was not so bad but that with a little earnest effort it might be set right.

Mr. SCHACHT (Vice-President), in putting the motion to the meeting, said that his only regret was that this able and complete address, appealing to the inner sense of right and justice in every man, was addressed almost exclusively to pharmacists. They must,

however, all do their utmost to let the public, *oi polloi*, the great mass of the community, understand the position, for it was from them and them alone that they could hope for any effective pressure on the legislature. If the only remedy lay in the direction of improved legislation, they could only hope to obtain it by pressure from below. He had the greatest confidence in the good sense of the public at large; but on special subjects that good sense required to be instructed.

The motion was then put and carried by acclamation.

The PRESIDENT, in reply, said he was about to apologise and explain to the many eminent pharmacists present, and those with whom he had been associated for many years, why he had ventured to address them on these social and political relationships of pharmacy, with which they were so much more familiar than he was, viz., that he had deliberately decided on being so obtrusive because of his conviction that these relationships would be better and more usefully put before the public by one occupying his position, than they would be by a practising pharmacist. But all these apologies and explanations were rendered unnecessary by the kind manner in which the address had been received, and he could only thank the members most heartily for the way in which the vote of thanks had been carried.

The Conference then adjourned to luncheon.

Upon re-assembling after luncheon, the first paper read was—
SECOND REPORT ON THE DIFFERENCES BETWEEN
THE ESSENTIAL OILS OF CINNAMON AND CASSIA.

BY ALFRED H. JACKSON, B.Sc., M.P.S., F.C.S.,
Associate of the Owens College, Manchester.

In the first report, printed in the *Year-Book of Pharmacy* for 1882 (pp. 395–400), and in the *Pharmaceutical Journal*, etc., it was shown that the relative density of cinnamon was 1·0097, whilst that of cassia was 1·0366; also that the specific refractive energy of cinnamon was ·32102, whilst that of cassia was ·28685.

Residue (1).—Some experiments were made upon this substance, which had been formed by passing steam through uncombined mixtures of cassia and potassium bisulphite solution. It had a brown colour, a sweet taste, with a trace of saline bitterness; it did not rotate the plane of polarization, though it reduced Fehling's solution slightly, and more abundantly after boiling with dilute

sulphuric acid; hence its sweetness cannot be assigned with certainty to the presence of a saccharose, as the Fehling's solution may have been reduced by the benzaldehyde, the presence of which was revealed by its odour, and the source of which was probably due to oxidation of the cinnamaldehyde. Some of the residue was evaporated to dryness and treated with ether, but none dissolved therein. On treating with methylated spirit, a small portion entered into solution; the alcohol was evaporated off, leaving a yellow residue, soluble in water, but having a more bitter taste than the original residue, thus showing that it was not identical with it. The source of the sweetness of this residue is interesting, because it may be the same as that which gives sweetness to the essential oils.

Bertagnini's Method.—(a) *With Alcohol.*—In the first report it was stated that the white magma, resulting from the combination of cinnamaldehyde with potassium bisulphite, was washed with methylated spirit. This alcoholic filtrate was distilled with sodium carbonate; also by passing steam through. To the distillates sodium chloride was added, but no change or separation of alcoholic from aqueous solutions was observable, and no oil was recoverable.

(β) *With Petroleum.*—The action of American petroleum spirit (b. p. 80–90°) was then tried. The essential oils were each shaken up with a large quantity of the spirit, and boiled; they dissolved, but mostly separated out again on cooling. On shaking some of the petroline solution of oil with the aqueous solution of potassium bisulphite, no satisfactory combination was effected.

(γ) *With Ether.*—Oil of cassia was shaken up with a potassium bisulphite solution, the mass thrown on to a filter and washed with ether until a mass of pearly-white crystals was left on the filter. The filtrate consisted of a lower layer of watery solution of potassium bisulphite, and an upper one of the ethereal solution. The ethereal solution was decanted, and the ether distilled off on a water-bath; the oily residue was then treated again with KHSO_3 solution, and the process repeated about a score of times, until no more precipitate was formed with the KHSO_3 solution. This oily residue (2)—oil of cassia deprived of cinnamaldehyde—was dried with CaCl_2 , and distilled:—1st, distilled under 100°, a few drops of a pale yellow, sweet, pungent oil, like cinnamaldehyde; 2nd, distilled about 260°, a few grams of a dark-brown, sweet, smoky, pungent oil; 3rd, distilled at 280°, a few grams of a dark-brown, bitter, smoky, pungent oil. There was a burnt, acrid smell, and a charred mass in the retort, showing *eremacausis*. These two distillates were similar to the sixth distillate from the original oil.

Oil of cinnamon was then treated similarly with the KHSO_3 solution. Its oily residue (3) had a brown colour distinct from that of cinnamon, with an aromatic smell akin to that of clove. An attempt to determine its boiling point showed that it was not a simple body; for, on distillation, it began to boil at about 200° , rising to 250° , leaving a waxy residue and decomposing at 260° . There was not a sufficient quantity at disposal for a fractionation to be made. Tested with concentrated sulphuric acid, it showed a brownish red colour; an addition of water then turned it into a light mass of greyish white resinous matter. Although residue (3) had ceased to give any precipitate with KHSO_3 solution, yet to find out whether it were quite free from cinnamaldehyde, the following tests were applied. A solution of magenta chloride was decolorized by KHSO_3 and SO_2 ; its violet-red colour was at once restored by the essential oil, but not until after a long time—and then but very faintly—by (3). A more delicate test was the addition of some HCl and KNO_2 to sodium sulphanilate; to the solution of this diazobenzene-sulphonate, made alkaline by NaOH , some of the essential oil—made alkaline—was added, and a violet-red colour was developed; a similar result followed the substitution of (3) for the essential oil, thus showing that (3) still contained a very small quantity of cinnamaldehyde. From two analyses of the ultimate composition of residue (3) the following results were got:—

Residue (3).	CO_2	H_2O	C.	H.
·192	·525	·156	74·57 %	9·02 %
·2515	·689	·211	74·75 %	9·32 %

Mean percentage, C, 74·66 and H, 9·17.

But as the determination of its boiling point shows that it is not a simple substance, a formula cannot be deduced from these results. Thus this method of separation does not yield sufficiently definite results to cause one to use larger quantities of so costly an oil.

Having a small sample of the pure oil of cinnamon left, it was burnt, with the following results:—

Oil of Cinnamon.	CO_2	H_2O	C.	H.
·292	·842	·1795	78·64 %	6·82 %
·1945	·568	·121	79·64 %	7·08 %
·374	1·09	·2335	79·5 %	6·93 %

Mean percentage, C, 79·26 and H, 6·94.

A comparison of this result with the analysis of (3) shows that the elimination of cinnamaldehyde alters very distinctly the composition of the oil, and so far justifies the use of Bertagnini's process as a good one, though not delicate enough for the end in view in this research. In conclusion, I have pleasure in acknowledging the kindly suggestions of Professor Schorlemmer during this work.

The PRESIDENT said he feared the author would not get the credit he deserved, because, like many Alpine and Himalayan climbers, he had not reached the actual summit of either of the mountains of difficulty he had so courageously attacked. He had, however, opened out and extended the track, so that either he himself, or some other worker, at some future time would be able to follow in his footsteps, and would find the road less laborious than it was before. For that work he was thoroughly entitled to the thanks of the Conference.

The next paper read was on—

THE BITTER PRINCIPLES OF *NERIUM ODORUM*.

Preliminary Report.

By H. G. GREENISH, F.I.C.

As a grantee of the British Pharmaceutical Conference, I have to report the progress I have made in the isolation of the bitter principles of the *Nerium odorum*, or sweet-scented oleander.

For a supply of the root, my best thanks are due to Dr. Dymock, of Bombay.

After a number of experiments, I found the following method the most convenient.

The powdered root is moistened with distilled water, packed in a percolator, and percolated with water until exhausted. It is possible thus to free the powder from every trace of bitterness. The percolate is shaken with chloroform until free from bitterness; this point is easily ascertained by warming a little of the supernatant liquid to expel the chloroform, and tasting. Although apparently free from bitterness, the aqueous liquors may still contain a small quantity of the bitter principles in solution, and this may be proved by concentrating to a small bulk and again shaking with chloroform; the yield will not, however, repay the trouble.

The chloroformic solutions are mixed and shaken with water

made alkaline with caustic soda as long as the latter is coloured brownish or yellow; a final washing with pure water removing any traces of caustic alkali. The greater part of the chloroform may then be recovered by distillation at a gentle heat. The remainder is allowed to evaporate spontaneously at a temperature of about 100° F.

The resulting yellow substance is dissolved in warm spirit. Should it still retain traces of chloroform, the solution must be well stirred until they are dissipated, as otherwise the subsequent operations are much impeded. To the warm alcoholic solution about four volumes of hot distilled water are added, and the whole allowed to cool. A mass of minute crystals separates which can be filtered off and washed with weak spirit; the operations of recrystallizing and washing are repeated until the crystals are obtained snow-white and quite pure.

The mother-liquor from the first crop of crystals is diluted with more water and allowed to stand twenty-four hours. Should any more crystals separate, they are filtered off. The filtrate is then shaken with chloroform until exhausted, and the chloroformic solution evaporated to dryness. The residue is subjected to a repetition of the process. The final result is a pale yellow amorphous mass which, when quite dry, is easily reducible to a nearly white powder. It should dissolve entirely and easily in spirit. Should the addition of water be followed by the appearance of a precipitate soluble in caustic soda or potash with a deepening in colour, the substance is contaminated with resin. It should be dissolved in spirit, the solution diluted with water, made alkaline with caustic soda, and exhausted by shaking with chloroform. The chloroformic solution will yield the purified substance on evaporation.

Although both the bitter principles are freely soluble in spirit, I prefer extracting them from the root with water, as the subsequent manipulations are thereby much facilitated. The process is an advantageous one, inasmuch as the substances are not brought into direct contact with either alkali or, indeed, any substance likely to produce decomposition, nor are they subjected to the action of heat but for a comparatively short time.

One of the substances, the crystalline one, is possibly identical with a crystalline substance which I formerly * considered to be a decomposition product of the bitter principles; the other, the amorphous, represents the nerioderin in a state of greater purity.

* See *Pharm. Journ.* [3], xi. 873.

I am now preparing the substances in larger quantity, and purpose reporting on their composition and properties at the meeting of the Conference next year.

The PRESIDENT said it would be remembered that some years ago Mr. Greenish obtained two principles from this Indian perfume and poison—which he called neriodin and nerioderein—neither of which, however, he succeeded in crystallizing. He had now crystallized the one, and obtained the other in a less impure condition than that in which he obtained it before. For this work he was entitled to the thanks of the Conference, and it was to be hoped that he would continue his investigations into these substances. The Conference was also much indebted to Professor Dymock, of Bombay, who was always ready to assist in such investigations.

A vote of thanks having been passed to Mr. Greenish and Professor Dymock,

Mr. NAYLOR asked whether it was the fact that both these principles were bitter, or only the amorphous one, and also whether they were both to be regarded as neutral, or whether that was still undecided. He thought it very improbable that the crystalline principle separated could be regarded in any sense as a decomposition product, especially having regard to the mode of extraction.

Mr. BENDER said both principles were stated to be bitter.

The following two papers were then read:—

REPORT UPON THE QUANTITATIVE SEPARATION OF STRYCHNINE AND BRUCINE.

By WYNDHAM R. DUNSTAN, F.C.S.,

Demonstrator of Chemistry,

AND F. W. SHORT,

*Assistant-Demonstrator of Chemistry in the Laboratories of the
Pharmaceutical Society.*

The complete separation of the alkaloids of nux-vomica has always been a matter of great difficulty, and the processes which up to the present time have been used for the preparation of the pure alkaloids are quite unsuited for quantitative application. In fact there is no

direct method for the separation of strychnine and brucine which gives concordant quantitative results. Professor Dragendorff* came to this conclusion after an examination of published methods, and after many trials of methods of his own suggestion, finally recommending the employment of an indirect method involving the titration or precipitation of the mixed alkaloids with a solution of potassium mercuric iodide. In the face of the above facts we made an examination of the solubility of many salts of strychnine and brucine, with the view of devising a direct method for the quantitative separation of the two alkaloids. Among the salts which we prepared were the ferrocyanides of strychnine and brucine, which were obtained in the first place by the double decomposition of the alkaloidal sulphates and potassium ferrocyanide. These salts were found to differ so considerably in their solubility that we commenced a full study of their properties and solubility under various conditions. A detailed account of this work here and now would be of secondary interest; it is, therefore, reserved for a future communication, and that portion alone dwelt upon that relates to the main problem, namely, the quantitative separation of the two alkaloids.

The first series of quantitative experiments were made with neutral solutions of strychnine and brucine sulphates, but the results obtained showed that the separation was not so complete as might have been anticipated from a separate examination of the aqueous solubilities of strychnine and brucine ferrocyanide. For this had shown that while strychnine ferrocyanide is but very slightly soluble in water, the similar salt of brucine might be termed a soluble salt. Now it was evident that in presence of brucine, strychnine ferrocyanide was not wholly precipitated from neutral solution. The next experiments were made in solutions which were decidedly alkaline with ammonium hydrate, and here the results showed that the separation, although much more complete than in neutral solution, was far from perfect. It may be worth while to record one or two of these experiments. A weighed quantity of the anhydrous alkaloids was dissolved in dilute sulphuric acid, solution of potassium ferrocyanide added, and then ammonium hydrate until the solution was distinctly alkaline, the precipitate was filtered off and washed with a little dilute ammonium hydrate. From the filtrate and washings the brucine was recovered by agitation with chloroform after excess of ammonium hydrate had been added; in these two experiments the strychnine was determined by difference.

* "Die chemische Werthbestimmung," p. 65, *et seq.*

TABLE I.

	Taken.	Found.
{ Strychnine	0·071	0·068
{ Brucine	0·053	0·056
{ Strychnine	0·077	0·067
{ Brucine	0·104	0·114

Experiments were now made in which the alkaloids were dissolved in a slight excess of sulphuric acid, so that the solution before the addition of potassium ferrocyanide was distinctly acid in reaction. From such a liquid as this it was found that strychnine was wholly precipitated, while brucine remained in solution. After a great number of experiments relative to the influence of (a) *concentration and the proportion in which the alkaloids are present*; (β) *acidity*; (γ) *time*; (δ) *temperature*, we have succeeded in devising an entirely satisfactory method for the quantitative separation of strychnine and brucine. The inferences from these experiments may be summed up as follows:—(a) Strychnine is entirely precipitated by potassium ferrocyanide from a solution acidified with sulphuric acid, both alone and in presence of brucine, even when only 0·0015 per cent. of anhydrous strychnine is contained in the liquid (*cf.* Tab. III.). Brucine alone is not precipitated under similar conditions until the strength of the solution nearly approaches that of saturation, and then the salt is slowly precipitated in large silky needles entirely differing in appearance from the granular and heavy precipitate of the strychnine salt. In presence of strychnine, however, brucine is precipitated more or less completely from sulphuric acid solution by potassium ferrocyanide if more than 0·06 per cent. of brucine is present; this is shown by the following results:—

TABLE II.

	Taken.	Found.
{ Strychnine	0·0878	0·1206
{ Brucine	0·2288	0·1900
Volume, 200 c.c.		
{ Strychnine	0·0930	0·0942
{ Brucine	0·0576	0·0540
Volume, 100 c.c.		
{ Strychnine	0·003	0·050
{ Brucine	0·100	0·053
Volume, 150 c.c.		

Tested by the nitric acid reaction, the strychnine residues contained much brucine. (β) Strychnine is more completely precipitated from a sulphuric acid solution of the sulphate than from a solution of the chloride or acetate acidified with the corresponding acids. The quantity of sulphuric acid present should never exceed 0.5 per cent. by volume of H_2SO_4 , the most favourable proportion is 0.25 per cent. by volume. Excess of acid causes decomposition of the potassium ferrocyanide and promotes other secondary reactions. (γ) The time required for complete precipitation depends upon the quantity of strychnine present; the precipitation is greatly facilitated by vigorously stirring the sides of the vessel with a glass rod. When this is done and precipitation occurs at once, it is usually complete in three or four hours. A solution containing 0.001 per cent. of strychnine is entirely precipitated in six hours. (δ) Rise of temperature above the normal should be avoided; when the solution is heated partial decomposition of the potassium ferrocyanide takes place.

Taking into account the above facts, we propose the following method for the quantitative separation of the alkaloids. Any quantity less than 0.2 gram of the mixed alkaloids is dissolved in about 10 c.c. of a 5 per cent. (by volume) solution of sulphuric acid (= 0.5 c.c. H_2SO_4), the solution is diluted to about 175 c.c. with water, and then made up to 200 c.c. with a 5 per cent. solution of potassium ferrocyanide. The liquid is transferred to a beaker, stirred occasionally, and allowed to stand from three to six hours. The precipitate is filtered off, and washed with water acidulated with sulphuric acid (about 0.25 per cent.) until the washings are free from bitterness. As the precipitate is liable to alteration upon drying, it is decomposed by the addition of a strong solution of ammonium hydrate, the filter washed with the same liquid and finally with chloroform, a sufficient quantity of which is used to entirely extract the alkaloid from its solution in ammonium hydrate. The chloroformic solution is then evaporated, and the anhydrous strychnine weighed. Here occurs a manipulative difficulty which deserves to be mentioned. If the solution of strychnine in chloroform be directly evaporated to dryness upon the water-bath, violent decrepitation will occur as the residue approaches dryness, resulting in the ejection of the greater part of the crystalline alkaloid from the dish. The chloroform should therefore be only partially expelled upon the water-bath, the remaining portion being spontaneously evaporated, and the residue afterwards cautiously dried in a covered dish upon the water-bath, or the entire operation may be conducted

in a flask. This behaviour is characteristic of pure or nearly pure strychnine, and is prevented by the presence of a small quantity of brucine, in which case the residue has a fused appearance. From the filtrate and washings the brucine is extracted by chloroform after the addition of excess of ammonium hydrate; in ordinary practice, however, either the brucine or strychnine may be estimated by difference. Table III. shows the results of a series of such experiments with different proportions of strychnine and brucine. It is to be noted that in these experiments the commercial crystalline alkaloids were employed, care being taken that the specimens selected were in definite crystals, but these alkaloids were not absolutely pure; the strychnine contained a mere trace of brucine and the brucine a similar trace of strychnine. It is further to be observed that in each case the strychnine and brucine have been directly determined.

As there is comparatively little difficulty in isolating strychnine and brucine from organic mixtures containing them, we have not considered it necessary to study the influence of organic matter upon the present results. When other alkaloids are present, the strychnine and brucine must be isolated before a separation is attempted. In the course of this investigation it has been frequently necessary to test a residue which was presumably brucine for the presence of strychnine, and for this purpose we at first employed the well-known reaction with sulphuric acid and potassium dichromate or manganic oxide, and found that for the detection of strychnine in presence of large quantities of brucine the test is useless, for the red colour produced by brucine under these conditions entirely masks the characteristic strychnine reaction.* We have made some experiments upon this point and generally upon the detection of strychnine in presence of brucine, which will form the subject of a future communication. Taking advantage of the separation of strychnine and brucine effected by the method just described, we have commenced experiments with the view of making the above process the basis of a method of preparing absolutely pure brucine; these experiments are still in process. As might be anticipated, the strychnine residues which were obtained gave evidence of traces of brucine when tested with nitric acid, the brucine also contained traces of strychnine. These traces were removed by reprecipitation. The results recorded in Table III.

* This has been previously noticed by Shenstone (*Pharm. Journ.* [3], viii. 446), and since these experiments were made by Hanriot (*Comptes Rendus*, xcvi. 4).

TABLE III.

	Taken.	Found.
{ Strychnine Brucine	0.034 0.151	0.030 0.148
{ Strychnine Brucine	0.058 0.103	0.057 0.0982
{ Strychnine Brucine	0.0162 0.0860	0.0158 0.0852
{ Strychnine Brucine	0.092 0.049	0.088 0.046
{ Strychnine Brucine	0.0348 0.0508	0.0326 0.0502
{ Strychnine Brucine	0.030 0.056	0.0298 0.055
{ Strychnine Brucine	0.065 0.118	0.065 0.112
{ Strychnine Brucine	0.135 0.022	0.124 0.0216
{ Strychnine Brucine	0.039 0.116	0.0387 0.114
{ Strychnine Brucine	0.08 0.111	0.075 0.111
{ Strychnine Brucine	0.086 0.033	0.0844 0.028
{ Strychnine Brucine	0.0348 0.0508	0.0326 0.0502
{ Strychnine Brucine	0.003 0.100	0.0026 0.100

show that for all analytical purposes the separation of strychnine and brucine effected by the method above described may be considered as complete.

Our thanks are due to Professor Attfield, F.R.S., for having

allowed this investigation to be carried on in the laboratories of the Pharmaceutical Society, and to the British Pharmaceutical Conference for having aided the work by a Research Fund grant.

REPORT UPON THE PHARMACEUTICAL PREPARATIONS OF NUX VOMICA.—I. ON TINCTURE OF NUX VOMICA.

BY WYNDHAM R. DUNSTAN, F.C.S.,
Demonstrator of Chemistry,

AND F. W. SHORT,
*Assistant-Demonstrator of Chemistry in the Laboratories of the
Pharmaceutical Society.*

Among the tinctures of the British Pharmacopœia, tincture of nux vomica stands pre-eminent in its union of potency and stability; the principal object of the present investigation was to test its uniformity. We have already shown (*Pharm. Journ.* [3], xiii. 665, 1053) that the nux vomica seeds of commerce vary considerably in the amount of alkaloid which they contain; it was, therefore, interesting in this connection to examine whether commercial specimens of the tincture similarly varied in strength. Twelve specimens of the tincture of nux vomica of the British Pharmacopœia were obtained from the principal manufacturers in London, and these were subjected to analysis. In the first instance we made a number of experiments to obtain a simple and accurate process for the estimation of the total alkaloid in the tincture. Professor Dragendorff* has already proposed a method similar to the method proposed by him for the assay of the nux vomica seeds. We have discussed this process elsewhere, and consider that the process for the assay of the tincture is open to the same objection there pointed out, namely, that it is unnecessarily long and intricate. When tincture of nux vomica is evaporated a resinous mass remains, which will be found to be only partially dissolved by chloroform, the greater portion remaining insoluble. It is practically impossible to wholly extract the alkaloid from the mass by the use of chloroform alone. There are two ways in which the alkaloid may be isolated from it: (1) By treatment with ammonium hydrate, which dissolves the resinous mass and allows the alkaloid to be easily withdrawn by one or two agitations with chloroform, which solution is extracted by shaking with dilute sulphuric acid,

* "Die chemische Werthbestimmung," p. 71.

and the alkaloid dissolved from this liquid after the addition of excess of ammonium hydrate by chloroform. The chloroform is then evaporated and the residue dried at 100° C. (2) By treatment with dilute sulphuric acid, which entirely dissolves the mass, and after the addition of ammonium hydrate, the alkaloid can be extracted in the pure state by chloroform. These processes both yield finally the same result, as will be seen from the following figures, which represent the percentage of alkaloid found in a specimen of tincture analysed in both the above ways:—

Process 1.	. . . . .	0.302 per cent.
Process 2.	. . . . .	0.304 „

The purity of the alkaloidal residues obtained by the above processes was tested by the ammonia-tannin method, which we have described in a previous paper (*Pharm. Journ.* [3], xiii. 1054).

The following two experiments suffice to show that the residues obtained consisted of alkaloid, (α) percentage of alkaloid nominally found, (β) percentage after ammonia-tannin process:—

		α	β
1	. . . . .	0.103	0.093
2	. . . . .	0.159	0.153

The following table shows the results of the analysis of commercial tinctures of nux vomica. In nearly all cases the second of the two above-mentioned processes was employed, 50 grams of the tincture being taken for analysis. In the residue of strychnine and brucine thus obtained, the strychnine was separated and estimated by the method of precipitation by potassium ferrocyanide described by us in a previous communication; the brucine was estimated by difference. The percentages are in all cases by weight.

Analysis of Tinctures of Nux-Vomica.

No.	Specific Gravity.	Percentage of Total Alkaloid.	Percentage of Strychnine.	Percentage of Brucine.
1	0.8426	0.224	0.077	0.147
2	0.8409	0.262	0.097	0.165
3	0.8438	0.208	0.068	0.140
4	0.8392	0.124	0.049	0.075
5	0.8450	0.360	0.121	0.239
6	0.8378	0.211	0.084	0.127
7	0.8377	0.136	0.046	0.090
8	0.8552	0.181	0.066	0.115
9	0.8398	0.196	0.077	0.119
10	0.8413	0.189	0.087	0.102
11	0.8407	0.168	0.060	0.108
12	0.8436	0.263	0.131	0.132

It will be seen from these results that the tinctures of *nuxvomica* now in commerce vary to a very considerable extent in alkaloidal strength. The strongest tincture (No. 5), containing nearly three times as much total alkaloid as the weakest (No. 4). It will be at once conceded that the important feature in a typical tincture of *nux vomica* is or should be uniformity in alkaloidal strength; the other constituents though doubtless valuable are of secondary importance. In view of the above facts, it seems desirable (1) that a standard uniformity should be officially recognised; (2) that the pharmacist should be able to prepare and guarantee the tincture of standard strength. This accomplished, the pharmacist, having determined the amount of total alkaloid contained in the seeds from which the tincture is to be prepared, employs a sufficient quantity to produce by a process of uniform exhaustion the standard tincture.

The work connected with this communication, which forms part of a general investigation of the pharmaceutical preparations of *nux vomica*, has been carried on in the laboratories of the Pharmaceutical Society by the kind permission of Professor Atfield, F.R.S.

The PRESIDENT, in proposing a vote of thanks to the authors of these papers, remarked that in the first paper they had made a most distinct advance in the knowledge of the chemistry of strychnine and brucine, and had given what seemed a thoroughly trustworthy method of determining the amount of strychnine. In dealing with the difficult subject of *nux vomica*, they first devised an ingenious apparatus for extracting the whole of the active principles. They then devised a method for separating and quantitatively estimating each of the alkaloids, and they were now apparently engaged in adapting their physical and chemical discoveries to the practical assay of the preparations of *nux vomica*. In all this they had done valuable service.

A vote of thanks to the authors was passed.

Mr. NAYLOR remarked that Mr. Siebold had already studied this subject pharmaceutically, and communicated his results to a former Conference. He then threw out the suggestion that the extract of *nux vomica* should be employed in the preparation of the tincture, and it seemed to him that this suggestion was well worthy of consideration. They should be slow to adopt any method which would entail either on the wholesale house or the pharmacist the duty of assaying the *nux vomica*, especially considering the great difficulty

there would be in obtaining *nux vomica* which would come up to the standard given by Messrs. Dunstan and Short. As far as he could understand, there was no standard fixed for the proportion the strychnine should bear to the brucine. He believed this was the first time the two alkaloids had been separated in a condition of purity, and therefore their physiological action had not yet been definitely ascertained. The weakness of *nux vomica* tincture which had been mentioned was probably due to one or both of two causes: first, pharmacists as a rule had not the means of sufficiently dividing the *nux vomica* so as to completely exhaust it; and, secondly, if it were heated too much, the alkaloids would be destroyed.

Mr. BENDER said in the paper alluded to by Mr. Naylor, which was read by Mr. Siebold at the Glasgow meeting, it was stated that various specimens of tincture of *nux vomica* had been analysed, and as the result, it had been found that in a good sample about nine parts per thousand of tincture consisted of dry extract. It was interesting to find that the results obtained by Messrs. Dunstan and Short were confirmatory of Mr. Siebold's conclusions in another respect, although arrived at by quite a different method. Mr. Siebold examined ten specimens of tincture, and found that the strongest was about three or four times the strength of the weakest, judging simply by the bitterness produced by the addition of it to a definite quantity of water, and by the amount of opalescence produced. He did not know that there was any conclusive evidence that the amount of strychnine and brucine in *nux vomica* was to be taken as an absolute indication of the medicinal value. If so, it would be better at once to use liquor strychniæ, or liquor strychniæ cum brucia.

Mr. HOLMES remarked that one important point which had been brought out in the paper was the great variation in the strength of the tincture of *nux vomica*. He remembered hearing Professor Bentley say that he had been nearly poisoned on one occasion by taking a much stronger tincture than he supposed he was taking. Messrs. Dunstan and Short had also shown that the seeds of *nux vomica* met with in commerce varied very much in strength. There were two or three varieties known, the Bombay being much stronger than the others. If this were the case and the seeds were mixed, it seemed to him that Mr. Bender's suggestion to use the liquor strychniæ was a very valuable one, for it would be almost impossible for a chemist to secure one particular kind of seed, and thus it would be very difficult to ensure a tincture of uniform strength.

Mr. TANNER said, that in his experience Mr. Siebold's suggestion for the preparation of tincture from the extract had not proved very satisfactory. A large quantity of spirit was necessary to dissolve the active principles from the nux vomica, and in the preparation of the extract evaporation of the menstruum was necessary. When the extract was re-dissolved to form the tincture, it did not entirely dissolve, for there was a proportion of fixed oil found in the extract; and further, in the tincture made by that method, after being kept some length of time, there was a brown deposit formed on the sides and bottom of the vessel, arising, probably, from some changed resinous substance.

Mr. CONROY asked if he correctly gathered that the strongest samples of tincture of nux vomica were those of the highest specific gravity.

Mr. PLOWMAN said it was so broadly—not exactly.

Mr. CONROY said, that seemed to suggest that the rectified spirit of the Pharmacopœia was not a suitable menstruum to exhaust the nux vomica with, and that a spirit containing more water would be preferable.

Mr. A. C. ABRAHAM observed, that formerly a weaker spirit was used, and was now generally used by foreign pharmacists. The Dublin Pharmacopœia ordered proof spirit; the French Codex was alcohol of 80° = sp. gr. 0.864; the Pharm. Germanica spiritus dilutus, sp. gr. 0.892. There was no doubt, he thought, that it dissolved the active principles more readily than rectified spirit.

Mr. JACKSON said that the use of a weaker spirit had been recommended at a former meeting of the Conference by Mr. Prescott, who used a spirit of sp. gr. .970, and found it much better than that of the official strength. In a former communication on the subject of strychnia, either to the Conference or to the Chemical Society, Mr. Shenstone had given a process for separating strychnia from brucia; but from the remarks now made it would seem as if Messrs. Dunstan and Short had now, for the first time, introduced a process for the preparation of pure alkaloids of strychnia and brucia. He should be glad to know if Mr. Shenstone's paper had been overlooked. There had also appeared in the *Pharmaceutical Journal* a notice of the Exhibition at Vienna, in which it was stated that samples of pure brucia were exhibited. It would be very interesting to know by what process they were prepared.

Mr. WHITLEY WILLIAMS said, if he recollected rightly, Mr. Shenstone came to the conclusion that no precipitation of strychnia succeeded in separating the strychnine from the brucine, and he

was surprised to hear that this was a precipitation process. It was probable that the brucine was carried down, not, perhaps, by any want of solubility of the brucine ferrocyanide, but was occluded in that peculiar physical manner with which chemists are unfortunately only too familiar. For instance, Meyer's solution was alluded to as a precipitant for the estimation of the alkaloids, and probably the proportion of pure alkaloid in a pure solution could be estimated quite exactly by that reagent; but if other substances were present, such as are usually found in vegetable extracts, the precipitate invariably carried down with it much foreign matter, and he believed that if Messrs. Dunstan and Short had examined minutely their ferrocyanide of strychnine, they would find it still contained brucine.

Mr. REYNOLDS (Leeds) begged to congratulate the President as chief of the school which had sent this valuable contribution to pharmaceutical research. There was no more healthy indication of the condition of a school than such bye-products. The original intention might be the production of successful students; but just as in a gas works, the bye-products were sometimes more valuable than the gas, so these researches were most valuable, and it was unfortunate that there were not more schools of pharmacy in the country from which similar results might arise. He trusted that the acceptance of pharmacy as a subject of study at Owens College would lead to a multiplication of such contributions in future.

Mr. PLOWMAN said he could not attempt to reply to any criticisms on the papers, but in reply to Mr. Williams he might repeat a sentence of the paper, which said—"As might be anticipated, the strychnine residues gave evidence of traces of brucine when tested with nitric acid; the brucine also contained traces of strychnine. These traces were removed by reprecipitation."

The PRESIDENT said he could not allow the discussion to close without thanking Mr. Reynolds for his kindly notice of the work done by the gentlemen who had been students in the school of pharmacy of which he had the honour of being a professor; but he must not give too much credit to him or his colleagues for this work. The Council of the Society had always supported the endeavours of the students, not only to study the known, but to dip a little way into the unknown; and had encouraged the Pharmaceutical Students' Association, which had similar objects to one which existed many years ago when he was a pupil there; and it had done good work in promoting original research. It was very gratifying to him to find men who had been members of the Students'

Association, and some of whom had been officers, coming forward and doing work which commended itself to the consideration of the Conference.

The next paper read was on—

THE PRESERVATION OF MEDICINAL HERBS BY ENSILAGE.

BY F. J. B. QUINLAN, M.D., M.R.I.A.,

Professor of Materia Medica, Pharmacology, and Therapeutics, Catholic University; Examiner in the same, Royal University of Ireland.

Both the practising and pharmaceutical branches of the medical profession are agreed as to the advantages of fresh medicinal herbs over the same substances in a dried condition, and a simple process which would supply fresh herbs all the year round has long been a desideratum. In the summer months of the year fresh indigenous herbs are of course forthcoming, but during the remaining time our resource has hitherto usually been herbs dried by being hung up in a loft, or perhaps by artificial heat—and it is unnecessary to dilate here upon the inadequacy of herbs so treated. In the hands of the pharmaceutical worker they frequently fall into powder, and often he is unable to distinguish between genuine herbs in their dried state and their spurious congeners. For example, I lately made a careful microscopic examination of the stock of *Conium maculatum* in the loft of an eminent wholesale establishment, and found that it consisted mainly of *Æthusa cynapium*, or fool's parsley; and this without the least reflection upon the honesty of the establishment, for I am certain that the adulteration arose partly from the ignorance of the gatherers, and partly from the difficulty of distinguishing between the two plants in their dried condition. The physician complains of the inferior physiological activity of the tincture made from the dried leaves; for example, tincture of hyoseyamus, made from the fresh leaves, will, if dropped into the eye, cause marked dilatation of the pupil; whereas the tincture made from the dried leaves causes no such reaction. In fact, I knew an instance where such tincture was returned with a query whether it was not tincture of belladonna. The first person who directed my attention to this point was the late Mr. Donovan, of Dublin, the eminent originator of the solution of arsenic, iodine, and mercury, called after him. Mr. Donovan had a tincture of digitalis which was much relied

upon, and he told me that in making this tincture he brought the alcohol to where the foxglove was growing, took the plant from the ground, bruised it, and plunged it in the spirit. He maintained that tinctures, to use his own words, "should be made from the live plant," and I believe that he was right. I may here express my doubts respecting tinctures; they are no doubt convenient and handy, but the question arises whether the ethylic alcohol extracts the virtues of all herbs—in the case of laudanum it certainly takes up as well the stimulating and injurious properties of the opium. This is unanimously admitted, and in latter years this old and celebrated tincture has for internal use been almost superseded by black drop (the manufacture of which has been successfully revived in Dublin), by Battley's sedative, the fluid extract of the Pharmacopœia, and other cognate preparations. An effort has been further made to preserve the active principles of fresh herbs by the "succⁱ" first* suggested to the profession in 1835, by Mr. Squire, and by the green extracts. The preserved juices of conium, scopolarium, and taraxacum at once made their mark, and those of belladonna and hyoseyamus have been added; and it would not be too much to say that they have almost completely superseded the cognate tinctures. Speaking of the juices, I may express my regret that the framers of our Pharmacopœia selected ethylic alcohol for their preservation, and not glycerin alcohol, which would answer just as well, and would not have an injurious effect in many cases of internal irritations. The green extracts are no doubt valuable preparations, but it is my experience that, if made exactly according to the Pharmacopœia, they will not keep through the autumn and winter. If, however, a supply of herbs in a practically fresh condition could be maintained all the year round, much benefit would accrue to the succⁱ, the green extracts, and to some tinctures, both in regard to ease and simplicity of preparation and to efficacy of action.

I venture to bring under the notice of the Conference a simple plan of accomplishing this most desirable object by the method of ensilage; and without the delay of describing the various modes tried, I will briefly explain the one which has succeeded perfectly. In doing so I must tender my acknowledgments to Dr. John Evans, Apothecary to the Queen and to the Prince of Wales, who placed his pharmaceutical laboratory at my disposal, and had the various silos prepared. The herbs in a perfectly fresh state are bruised to a pulp in a mortar, and then placed in glass bottles; being well tamped down until there is just room for the glass stopper, which is

* *Pharmaceutical Journal*, vol. i.

then forced in so as to exclude *every particle* of air, and the whole top is encased in beeswax softened by heat. This is the best capsule: tar is too dirty, sealing-wax is apt to crack, and bladder rots. These bottles are now buried in the ground at a depth of three feet; and so treated, belladonna, conium, and other herbs have kept for four months perfectly sweet and fit for pharmaceutical purposes. From what I have seen of agricultural ensilage, I have no doubt that the bottled herbs would keep for six or even eight months, or perhaps longer. Of course every now and then a bottle will fail from imperfect manipulation, and that often without visible cause, most likely from a little air having been left in. When the bottle is taken out of the ground this failure is at once rendered evident by the spots of mildew appearing in the vegetable. I exhibit two specimens thus spoiled, one wholly and the other partially so.

The factors of the decomposition of vegetables are the putrefactive germs contained in the air, the actinic rays of the sun, heat, and moisture; and their comparative influence is shown by the following simple experiment:—Four bottles were filled with fresh leaf pulp, as already described, and were closely corked; the corks, however, were not tied or waxed. Nos. 1 and 2 were exposed to the light, but not to the direct action of the rays of the sun, the cork of No. 1 being left loose and that of No. 2 being driven very tightly in. No. 3 was put beside the others but covered by a nest of three earthen jars, one over the other, so as to expose it to the same temperature but not to light. No. 4 was buried in the ground. In thirty-six hours there was mildew and a putrefactive smell at the mouth of No. 1, and the cork of No. 2 was blown clean out by putrefactive gas. In sixty hours there was mildew in No. 2, and the cork of No. 3 was loose, but No. 4 was unaffected. Of course No. 4 would not long remain so, as the ensilage was imperfect. This experiment is useful as showing the conditions which must be avoided; and I may add that a locality shaded from the sun must be selected, and that no place answers better than a roofed shed with a free circulation of air—which will keep the soil quite dry.

There is a special class of medicinal herbs for which ensilage is indispensable, viz., those which must be used in the fresh state. An example of this is the *Galium Aparine*, which is now much employed as a dressing for ulcers and cancers. This plant is bruised fresh, made into a kind of poultice, and placed upon the sore.* By ensilage only can it be used in winter and spring.

* *British Medical Journal*, June 16th and July 9th, 1893.

It is unnecessary, and would here be unsuitable, to dilate upon the success which farm ensilage has attained in the hands of American and continental agriculturists. There is, however, nothing new in the discovery or rather revival of *M. Gouffart*. It was practised thousands of years ago by the ancient Egyptians, and is depicted in their tombs; it was worked in Prussia and in Spain from time immemorial; and the well-known Irish potatoe pit, which preserved "the murphies" so fresh and good, was a rude ensilage. Still more to the point, however, is the plan of our grandmothers, of preserving green gooseberries. These worthy old ladies, who might perhaps give some useful hints to the housekeepers of to-day, used to pack the green gooseberries tightly in tall wide-mouthed bottles, a small quantity of water being added. These bottles were placed standing in a pan of water, which was very gradually raised to the boiling point. A copious steam now rose from the bottles, partly from the water and partly from the gooseberries; and at the right moment, when the steam was in full vent and the water just boiled away, the bottle was corked, withdrawn from the water, tied securely, and waxed, and without delay buried in the ground. I have frequently in the depth of winter eaten well-flavoured gooseberry pies so produced; and the process is interesting as showing the possibility of ensilage* on the scale suitable to the wants and capacities of the pharmacist, whether on a large or small scale. Addressing a practical audience, it is of course hardly necessary to add that an ensilage bottle once opened, like a bottle of claret, must immediately be made use of.

The PRESIDENT remarked that Dr. Quinlan had raised several questions besides the one which gave the title to the paper, such as the pharmaceutical value of dried herbs, the claims of fresh juice as against green extracts, and so on. He thought he must decide that, while thanking him for all he had written, the members must in the discussion confine themselves to the main point of the preservation of medical herbs by ensilage. He was sure all would agree in giving Dr. Quinlan a hearty vote of thanks for his paper.

A vote of thanks having been passed,

Mr. EKIN asked Dr. Quinlan if he had taken note of the temperatures at which he preserved the plants. He understood him to say that success was due to the exclusion of the air; but he presumed

* Any reader desirous of seeing a short but sufficient account of the agricultural aspect of ensilage, can refer to the illustrated pamphlet by Mr. Thomas Christie, F.L.S. London: Christie & Co., 155, Fenchurch Street, E.C. 1883.

that only meant outside infected air, because the very process of ensilage was dependent on a certain amount of air being shut up in the green vegetable. Some experiments had just been published, which were detailed to him by the gentleman who made them, before publication, and they promised to throw a new light on the whole matter. This gentleman had experimented for years on silos, and had paid great attention to the temperature. He found that a certain fermentation went on, and the temperature of the whole mass must then be raised beyond 50° C. when the germs became sterile, and green fodder would keep indefinitely. It would be quite possible to admit filtered air to this fodder after it had reached this stage, and unlike Dr. Quinlan, he seemed to lay no stress at all on the exclusion of light. The failures which had hitherto taken place arose from the whole mass not having been raised to the necessary temperature. There was an immense field for this process pharmaceutically; but it was yet in its infancy, and a great deal of further observation was required. He hoped Dr. Quinlan would continue his researches, and report again; but it occurred to him that the fermentation and high temperature necessary to success would in some cases act prejudicially on the active principles of the plants.

Dr. SYMES said Dr. Quinlan had done good service by calling attention to this method, but he did not think it could fairly be called ensilage. As Mr. Ekin had said, in ensilage as practised by agriculturists a certain amount of air was present, and fermentation ensued, and if that fermentation occurred in the bottles it would probably be the initial stage in the destruction of the active principles. The practice of Dr. Donovan, which had been cited, seemed to show that herbs should not be kept even in the fresh state after they had been gathered; and it was well known that if roots were to be dried, the less they were crowded together, and the sooner they were placed in a position where they would dry rapidly, the better they were preserved. He took it the process depended on the exclusion of the air, and would suggest that one of the bottles should be placed under the receiver of an air pump, with some arrangement for forcing in the stopper when the air had been exhausted. One of the experiments quoted seemed to indicate that there was some advantage in burying the bottles, but it seemed to him that if they were sealed as perfectly as was described, and then placed in a cool dark place, the result ought to be equally good.

Mr. STANFORD asked whether this process did not alter the medicinal character of the plants; because in all the agricultural

specimens he had seen, the fodder was quite different to the original plants. He should think an ensilaged plant would differ as much from the original as sauerkraut from cabbage.

Mr. PLOWMAN asked whether the statement that tincture of hyoscyamus made from the fresh leaves dropped into the eyes caused dilatation of the pupil, whereas that made from dried leaves did not, was founded on observation.

Dr. QUINLAN said the statement was founded on his own experiments.

Mr. PLOWMAN said he was about to remark that hyoscyamus leaves varied very much in quality. The mydriatic action was due to one or more alkaloids, and it seemed almost incredible that a tincture of fresh leaves should possess this action, while a tincture of the same leaves carefully dried at a low temperature should have the natural alkaloidal salts so altered that this action should be destroyed.

Mr. HOLMES, referring to *Galium aparine*, asked if Dr. Quinlan considered it to be as active in the ensilaged state as when fresh. He should also like to know if Dr. Quinlan had formed any opinion as to what the preservation was due. It was understood that in ordinary ensilage a small amount of alcohol was formed, which would naturally act as a preservative.

Mr. WILLMOTT suggested that Dr. Quinlan should continue his experiments. It must be a difficult matter to expel the air completely from the bottles; and even then it was a question how far the elements of decomposition were present in the plant itself. Some time ago he had occasion to carry out some experiments in which it was necessary to exclude the air, and to expose the product to a considerable temperature, and found that a higher point than that mentioned by Mr. Ekin was necessary. It was a question how far this would affect the qualities of the plant.

Dr. QUINLAN said it would be evident from the character of the paper and the time when he commenced the investigation that he did not bring this forward as a completed communication, but simply as one worthy of inquiry and discussion. The question was in its infancy, and his principal reason for now introducing it was in order to get additional light upon it from the various scientific and practical men before whom it was read. That expectation had been amply fulfilled, and he should now, he hoped, be able to carry on the investigation to a complete and satisfactory result. Next year he trusted to have the opportunity of stating further results, obtained with the advantage of the suggestions which had now been made. He might tell Mr. Ekin that he was

quite aware of the importance of temperature. He was induced to take up the matter from seeing ensilage going on in Belgium last summer, and there, after the stuff had been cut, tamped down and covered, they occasionally ran a tube down into it with a thermometer, and if the temperature was above a certain point it was known that the silo was "done for." Of course the only object of excluding air was to exclude germs, in the same way as the old surgeons, who knew nothing about germs, always endeavoured to exclude the air from a wound; he should not have any objection to filtered air entering the bottles. Dr. Symes's suggestion about the air-pump was very valuable, and he would endeavour to act upon it; and he would also place registering thermometers in the bottles buried in the ground. He found that there was a distinct advantage in burying the bottles. Mr. Stanford's question was one which he could not as yet even approach, not having had an opportunity of testing the medicinal character of the herbs so preserved. This was the keystone of the arch, and if it fell out he would take care to report the collapse which would follow. The fermentation and sweet taste which arose in ensilage was well known to every one. He was obliged to Mr. Plowman for putting the question he had, and might state further, that the two samples of tincture of hyoscyamus were obtained from Dr. Evans's establishment, and were both made from the biennial plant, in one case fresh, and in the other dry. The one made from the green plant caused dilatation of the pupil; and a case occurred where the tincture was sent back with a query whether it was not tincture of belladonna. The question whether decomposition took place could only be solved by further experiment. He thought probably some herbs would silo well, some middling, and others not at all, but he should continue the experiments and report the result next year.

The next paper read was on—

THE MULLEIN PLANT.

By F. J. B. QUINLAN, M.D., M.R.I.A.,

Professor of Materia Medica, Pharmacology, and Therapeutics, Catholic University; Examiner in same, Royal University of Ireland.

The therapeutic action and properties of the mullein plant have been thoroughly discussed in the medical journals, and it is my intention, therefore, on the present occasion to view it in its pharma-

ceutical aspect only.* As this drug is new in pharmacy, I may mention that in the early stages of pulmonary consumption it has a distinct weight-increasing and curative power, similar to that of cod-liver oil or of Russian koumiss; and that it is superior to either in the point of view of comfort to the patient. The repulsion and even disgust with which cod-liver oil is swallowed by multitudes of invalids is well known; and the fact that many thousands of gallons are annually thus consumed is a sure proof of the potency of a medicine which, however, many phthisical invalids are unable to swallow at all. Koumiss, as made at Samara, in Russia, from the milk of mares, is very agreeable, and is a better weight-increaser than even cod-liver oil. It will not, however, bear travelling; and to go through the koumiss cure the sufferer must accomplish the long and tedious journey to Samara, in Southern Russia.† The koumiss manufactured in these countries from cow's milk is, for the chemical and physiological reasons adduced by Dr. Carrick, a very ineffectual substitute for its Russian namesake, made from the milk of the mare. Mullein is, as I shall presently show, a very palatable and agreeable remedy, and is much liked by the patients, and has, I believe, a great future of usefulness before it. I have found it equal to cod-liver oil; of Russian koumiss I have no personal experience.

There are five mulleins, all belonging to the natural order of Scrophulariaceæ, but the one to which I refer is the great mullein, the *Verbascum thapsus* of the botanist, and the cuneal mhuipe ‡

* *British Medical Journal*, January 27th, February 10th and 24th, and March 3rd, 1883; *Medical Record*, March, 1883; *Therapeutic Gazette*, March, 1883; *Australian Medical Journal*, April, 1883; *Medical Press and Circular*, February 7th, 1883.

† For an interesting account of this cure, see the treatise by Dr. G. Carrick. Blackwood & Sons, London, 1881.

‡ The Irish name of mullein means a remedy good for asthma or cough; for it is a curious circumstance that pulmonary consumption appears to have been almost unknown among the aboriginal Irish. Alone in Western Europe, Ireland, on account of its remote situation, did not become a part of the Roman Empire; a circumstance to be regretted, inasmuch as it deprived her of the benefits of Roman civilization, which has everywhere it reached left enduring landmarks. The Roman military authorities contemplated the conquest of Ireland, and were actually preparing one legion for the purpose, when the appearance of barbarians on their eastern frontier caused the Imperial government to concentrate their troops and withdraw from Britain. Consequently the English invasion of Ireland in the 12th century found the people very much in the same condition that Julius Cæsar found their British congeners—a thinly inhabited country, with scarcely any tillage, and where the population passed their lives almost entirely in the open air, and subsisted on their flocks and herds. Experience has shown that among such a people, as among the Tartars of today, pulmonary consumption is almost unknown; and recent German researches

of the ancient Irish medical writers, who make frequent allusion to it in the MSS. in our Irish collections. It is delineated in plate 1437, vol. vi. of Sowerby's "British Botany," and in the same volume, page 110, it is stated that the great mullein "is rather sparingly distributed over England and the South of Scotland." In Ireland it has been always carefully cultivated, and in many places upon a very large scale, in obedience to a steady demand by phthysical sufferers. It is on sale in most of the medical establishments in Dublin and throughout Ireland, and it is seldom that you will find an Irish newspaper in whose advertising columns it is not offered. Still, it is not in the Pharmacopœia, nor was it formally recognised by the medical profession until the present year; the only official preparations of it known to me being the fluid extract of the leaves and the same of the root, preparations which I have tried on a large scale, and to which I shall presently allude. Dr. John Evans supplies the succus and the fresh leaves.

The mullein is a hardy biennial plant, with a thick stock from 18 inches to 4 feet high, with very peculiar large woolly and mucilaginous leaves, and a long flower-stalk with ugly yellow and nearly sessile flowers. The leaves are best gathered in the late summer or autumn, from the biennial plant, shortly before it flowers. In former times the mullein appears to have been esteemed as a remedy for diarrhœa, and Dioscorides, Culpepper, and Gerarde favourably allude to it in this regard.

The old Irish method of administering it was to take 4 ounces of the fresh leaves, or a corresponding quantity of the dry, and place them in a pint of fresh cow's milk. This was now boiled for ten minutes, strained, a little sugar added, and the mullein milk drunk while still warm. This dose is soothing and grateful to the præcordia, and phthysical sufferers like it, and experience a want when it is withheld. The superiority of the fresh leaves is very marked; and the dose ought to be taken twice or three times a day. When the leaves are not available, the next best resource is the juice, fortified with a little spirit or glycerine, or fluid extract of the leaves. The fluid extract of the root yields good results, but I prefer the other. The taste of the succus verbasci, or of either of the extracts, is *per se* disagreeable; but can be completely masked by the addition of some Guinness's porter, which acts as a slight adjuvant, and forms an agreeable mixture. The best method of all

explain the reason why. Of course exposure pulmonary diseases were common enough among the Irish aborigines, and for them the mullein was employed.

is the fresh leaves boiled in milk; but sometimes in advanced cases with delicate stomachs, so much milk decoction is found to be heavy. In that event it is necessary to first peptonize the milk with pancreatic fluid, and to add a pinch of sodium bicarbonate. The mullein decoction made with peptonized milk digests at once, and the slight bitterness of the peptone is completely covered by the taste of the mullein. In advanced cases of consumption the mullein, although powerless to cure, relieves the cough and diarrhoea, and thus leaves the stomach free for nourishment; in fact, it is itself looked upon by the patient more as a food than as a medicine.

Mullein is one of the herbs which I have ensilaged, and I trust by that means to keep it fresh and fit for the milk decoction all the year round. I may here allude to a remotely possible source of risk connected with it on account of the resemblance of very young mullein leaves to young leaves of foxglove. I know an instance in which a gardener during the present season actually transplanted a very young plant of foxglove into a mullein bed. Of course later on this resemblance would not deceive the most inexperienced.

The PRESIDENT having moved a vote of thanks to Dr. Quinlan,

Mr. HOLMES asked whether the specimen of the plant exhibited was the same as was used in the experiments described, because it appeared to him not to be *Verbascum thapsus*, which had a much more woolly surface.

Dr. QUINLAN said that the plant was usually more woolly; the specimen was, however, the *Verbascum thapsus*.

Mr. CONROY asked if the cultivated plant was equal to the wild plant in its medicinal properties, for many plants lost in therapeutical value by cultivation. He should also like to ask whether the Doctor had satisfied himself that the beneficial results were attributable to the mullein, and not to the milk in which it was taken or the stout which followed it.

Mr. H. WYATT said this plant, though comparatively little known in the north of England, was much valued in some parts of the Midland Counties as a horse and cattle medicine, and particularly in Ireland. A great portion of the working population of Bootle came from Ireland, and it was from them he first heard of it being used as a domestic remedy in consumption. When it was known he had some in his garden, the out-patients of the Bootle hospital frequently asked him for it, and it was in his capacity as dispenser

to that institution that he witnessed the beneficial effects and became acquainted with the peculiar method of preparing it with milk, the only way by which the nauseous taste is masked. He did not think there was much doubt about the specimen exhibited being the real plant, as it corresponded very well with five plants he had, making allowance for the difference which he found cultivation made in the margin of the leaf. His first plant came up spontaneously, and it seemed identical with specimens he had since obtained from Warwickshire. His old Irish gardener never would admit the plant was ugly, and once remarked to him, "Sure it's not such an ugly plant; for there's one bright baby always at the top of it;" referring to a peculiarity in its mode of flowering; it always had a bright ring of flowers round the top of the spike.

Mr. BORLAND said it was hardly correct to say that this plant had only lately come into use medicinally, for he found it was used for almost all the ailments to which Dr. Quinlan referred, as far back as 1753, and was mentioned in an old dispensatory written by Dr. James at that date. It was not, of course, recommended as a substitute for cod-liver oil, that not being known.

Mr. WILLMOTT hoped Dr. Quinlan would state the source from which these plants could best be obtained.

Mr. ATKINS asked if the plant was popularly used in Ireland for pulmonary diseases.

Dr. QUINLAN said it was, and was curative in the earlier stages and palliative in the later. The objection raised by Mr. Conroy that the beneficial effects noticed might be due to the milk or the stout was one which had been mentioned again and again, but he had been able to bring forward a number of experiments showing that where the milk or stout was administered without mullein, there was no such weight-increasing power shown; he could not, however, here go at length into that question, which was really a medical one. He agreed with Mr. Borland that this plant had been used long ago, for it was mentioned by Culpepper, Gerarde, and other writers; but it had died out, and the profession had ceased to employ it, and its use was only kept up amongst the Irish humbler classes. Whether the wild or cultivated plant was the better, he could not say positively, but as far as he could judge they were equally good. The demand in Ireland was so great that the supply of wild plants was not sufficient to meet it, and it was cultivated on a very large scale. It fetched a good price, 2*d.* or 3*d.* per plant. As to the mode of using it, the only really good preparation was the one he had mentioned, boiling it in milk; when boiled in water

it would no doubt be equally useful, but its taste would be so nauseous that it would not be readily taken.

The Conference then adjourned.

On Wednesday morning, the Conference re-assembled at half-past ten.

THE LATE MR. ATHERTON.

The PRESIDENT said he had just received an intimation of the decease of an old friend of the Conference, one of its earliest supporters—a man who was local secretary of the third meeting, at Nottingham, and one who by his tact and energy did much towards the success of the meeting, and towards floating the then young Pharmaceutical Conference. It was mainly to his powers of organization that the first Annual Exhibition of Pharmaceutical Appliances was held in connection with the Conference. He was sure every member of the Conference would join with him in deep regret at the loss of John Henry Atherton.

A paper was then read, entitled—

ADDITIONAL NOTES ON THE BITTER PRINCIPLE OF HYMENODICTYON EXCELSUM.

BY W. A. H. NAYLOR, F.C.S.

In a paper read at an evening meeting of the Pharmaceutical Society in April last, I had the honour of presenting a preliminary account of an inquiry undertaken with the object of ascertaining the nature of the bitter principle of the dried bark of *Hymenodictyon excelsum*. In this communication were embodied results which show that the investigation was pursued to an extent which led to the discovery of an alkaloidal substance, the existence of which was deemed to supply an unequivocal answer to the question at issue. It also contained by inference the affirmation that the bitterness of this particular bark was not due to *æsculin*, or to its decomposition product, *æsculetin*, as alleged by Broughton, who had previously examined it. Further, it gave a description of its general properties and its behaviour towards certain reagents. In addition, such data were supplied as it was thought might afford an insight

into its constitution. The conclusion arrived at was to the effect that it bore a relation to either beberine or the amorphous alkaloid of cinchona or paricine, by comparison among which the last enjoyed the largest degree of favour.

And now having hastily glanced at the facts hitherto obtained, it may be permitted me to remark that in fulfilment of a promise made at the time of these results, I have meanwhile more completely investigated the subject, and these additional notes are submitted as a sensible advance upon our knowledge of the bitter and probably active principle or principles of this valuable drug.

Method of Extracting the Alkaloid.—Three methods were experimented with for extracting the alkaloid. The first differed only from that previously employed in respect of the process used for purifying the crude base. This consisted essentially in mixing the finely powdered bark with one-fourth of its weight of lime, and converting into a thick paste with water. The mixture was dried and exhausted with 90 per cent. alcohol. The percolate was acidified with dilute sulphuric acid, the alcohol recovered by distillation, and the residue treated with hot water. From experiments with this solution it was found that the addition of carbonate of ammonium caused a black precipitate, which was assumed to be a decomposition product. After filtration caustic soda was added, when a feebly coloured gelatinous precipitate fell. The whole of the remaining solution was similarly treated. The crude alkaloid from caustic soda was dissolved in ether, and the ethereal solution poured into large quantities of light petroleum spirit and allowed to stand. By this treatment reddish flocks at first separated out, which subsequently agglomerated and deposited. The alkaloid was recovered by distillation, redissolved in dilute sulphuric acid, and reprecipitated with caustic soda, and purified by solution in ether.

The second method was more simple, and consisted in exhausting with chloroform the mixture of lime and bark dried at a low temperature, and withdrawing the alkaloid from solution by agitation with weak sulphuric acid. From this acid solution the alkaloid was separated by caustic soda. To obtain it in a state of purity it was only necessary, after washing it thoroughly, to take it up in ether, evaporate, and subject the residue once more to the same operation.

The third method contemplated the extraction of the alkaloid by the use of oxalic solution, but from the difficulty experienced in effecting a complete removal of the colouring matter from the product, the process was abandoned. In instituting a comparison of

the respective merits of the three methods, the second deserves the preference when adjudged on the basis of purity of product rather than that of quantity in regard to yield.

Description of the Alkaloid.—In the moist condition, as obtained by precipitation with caustic alkali, it is a gelatinous mass of a cream colour and greedy of water, which it retains with extreme tenacity. By exposure it shortly acquires a decided yellow colour, which deepens with increase of temperature, and passes into a light brown at 100°C . It has a persistently bitter taste, which is more quickly perceived when in solution than when in the solid state. It is readably soluble in alcohol, ether, chloroform, benzol, and light petroleum spirit. On evaporation of its ethereal solution at a slightly elevated temperature, it separates out in the form of oily drops. If the heat be continued beyond that required for the complete evaporation of the ether, the oily drops coalesce, and the whole assumes the character of a soft sticky resin. It commences to fuse at 66°C ., and at 70°C . it will flow with ease sufficient to admit of its transference to another vessel. It neutralizes acid completely, and the solutions are not fluorescent. It refuses to yield crystallizable salts with nitric, hydrochloric, acetic, sulphuric, phosphoric, and hydrobromic acids. Its solution in hydrochloric acid is precipitated by nitric acid, sodium nitrate and phosphate, potassium iodide, ferro and ferridecyanide and bichromate, and mercuric chloride, in addition to the usual alkaloidal reagents. Potassium sulphocyanide, added in excess to a neutral solution of the base in acetic acid, gives reddish yellow oily drops. A feebly acid solution gives with bromine a bright yellow precipitate, and with solution of chlorinated lime a white precipitate unaffected by ammonia. A two per cent. solution in 90 per cent. alcohol is optically inactive.

Composition of the Alkaloids.—For determining the composition of the alkaloid two series of combustions were made. The one from the base obtained by the lime process, the other from the products resulting from the chloroformic extraction. It was first of all ascertained that the alkaloid suffered no loss between 100° and 110°C . This was regarded as trustworthy evidence that it became anhydrous above 100°C ., and in more than one instance its combustion afforded satisfactory proof of its stability at 100°C . It may be stated that in every case the body was burnt with cupric oxide in presence of metallic copper in a stream of oxygen. The products obtained by the lime process (1) and by chloroformic extraction (2) respectively, after purification by ether, gave as a mean the following numbers:—

	(1)	(2)
Carbon.	77.02	77.45
Hydrogen	11.02	10.82

As the products of chloroformic extraction (2) gave a slightly higher percentage of carbon, its nitrogen was alone estimated. Two determinations were made by the method of measurement. In one experiment .364 gram of alkaloid gave 34.2 c.c. of gas, which, when corrected for temperature, pressure, and tension of aqueous vapour, was found to be equivalent to 11.32 per cent. of nitrogen. The platinum compound was next prepared and examined. To a solution of the purified alkaloid in hydrochloric acid perchloride of platinum was added to complete precipitation. The double compound was thoroughly washed with warm water and dried at 105° C. When moist it was yellow, when dry reddish yellow. It was appreciably soluble in boiling water, from which it separated on cooling in a granular condition. On ignition it left 25.27 per cent. of platinum. A determination of its chlorine yielded 27.70 per cent. From these results the following formula has been deduced for the alkaloid, $C_{24}H_{40}N_3$. For the purpose of ready comparison the results obtained are placed by the side of those theoretically yielded by this formula:—

	Found.	$C_{24}H_{40}N_3$.
Carbon	77.45	77.83
Hydrogen.	10.92	10.81
Nitrogen	11.32	11.35
Pt compound	25.27 pt.	25.24 pt.
Cl in Pt compound	27.70	27.22

The platinum salt will therefore have the formula $C_{24}H_{40}N_3 \cdot 2HClPtCl_4$.

For the alkaloid I propose the name "hymenodictyonine." Its main peculiarity is the absence of oxygen in its constitution, and thereby it adds one more to a numerically small class whose natural bases are, perhaps with one exception, volatile.

The salts of the hydrochlorate and nitrate have been prepared, and their study has already commenced.

The determination of their composition and that of certain derivatives of the alkaloid are engaging my attention, and I hope shortly to be able to publish an account of them. It is also extremely desirable that the physiological action of the alkaloid should be put to the test. In regard to this point, it may be recorded that a gentleman having incidentally tasted a little of the alkaloid equal in

size to a pin's head, experienced flushing of the face, followed by giddiness and frontal headache.

In addition to the alkaloid, an indifferent principle has been obtained from the bark. It was associated with the first precipitate of crude alkaloid produced by the caustic soda in the lime process. It was observed from its remaining insoluble when the alkaloid was treated with strong alcohol or ether. Repeated boiling with alcohol left it almost colourless. It then presented the appearance of tannic acid. A microscopical examination showed it to consist of micaceous scales. It has a pure bitter taste, quite distinct in character from the bitter of the alkaloid. It is sensibly soluble in hot alcohol, but not in ether or chloroform, and is readily dissolved by dilute acids, from which it is precipitated by caustic alkalies. In reaction it is neutral. Nitrogen does not enter into its constitution. It appears to be a neutral principle, and possibly may be a decomposition product of a glucoside. It was dried at 105° and burnt, when it gave the following numbers, which closely correspond to the formula $C_{25}H_{49}O_7$:—

	Found.		Theory. ($C_{25}H_{49}O_7$).
	(1)	(2)	
Carbon . . .	65.00	64.84	65.07
Hydrogen . . .	10.76	10.50	10.62.

Whether this body be an educt or a product cannot at present be definitely asserted, and until this point has been ascertained it has been thought advisable not to designate it by any particular name.

The conclusion to be drawn from these results appears to be that the bitterness of the dried bark of *Hymenodictyon excelsum* is due in part, if not in the main, to the existence of an alkaloid whose composition is represented by the empirical formula, $C_{24}H_{40}N_3$. In part too its bitterness may be due to the neutral principle having the composition $C_{25}H_{49}O_7$, or to a substance of which it may be a product of decomposition.

There now remains to me the pleasing duty of acknowledging the assistance which my friend Mr. T. G. Nicholson has rendered me in the prosecution of this investigation.

The PRESIDENT proposed a vote of thanks to Mr. Naylor. He thought his expectation that he had made a distinct advance in the knowledge respecting the bitter and probably active principles of this drug was thoroughly well founded. It was to be regretted

that, as he stated, the salts refused to crystallize, but it was to be hoped that they would reconsider their decision and succumb to the irresistible coaxing of Mr. Naylor at some future time.

The vote of thanks having been passed—

Mr. DOTT inquired if Mr. Naylor considered the formulas he had given for the alkaloidal and neutral principles were probable, seeing they both contained an uneven number of perissad atoms.

Mr. WILLIAMS wished to ask Mr. Naylor if he analysed the volatile alkaloids as well the solid, and found the numbers the same in both cases; because, as he distilled it with caustic potash, he should imagine that the product of distillation of the solid alkaloids in the presence of caustic potash would probably be very different from the body he started with.

Mr. HOLMES asked whether the results obtained by Mr. Naylor threw any light on the constitution of quinine. This plant belonged to the same natural order as the cinchonas. Mr. Naylor mentioned some decomposition products having a peculiar odour, and it might be possible that some of these products might have a similar character to some of the decomposition products of quinine.

Mr. MOSS asked if Mr. Naylor had examined the neutral principle of *Hymenodictyon excelsum*, with a view to ascertain whether it was a glucoside or not. With regard to the uneven numbers in these formulas, he apprehended they were merely empirical formulas, and did not profess in any way to give the exact constitution of the bodies referred to.

Mr. NAYLOR, in reply, said Mr. Moss had anticipated his reply to Mr. Dott. He regarded these as probable formulas, but they were only empirical. The derivatives of the alkaloid had yet to be carefully studied, when possibly they might be able to arrive at the constitutional formula. With regard to the other point, namely, the neutral principle, it was quite possible it might be a decomposition product of some glucoside, and he thought it highly probable, but that was a point which still remained to be cleared up. He was careful not to state in his paper that the alkaloid was volatile, because he was not quite certain as yet whether the volatile portion was a decomposition product or whether it was actually the alkaloid itself.

In consequence of the great length of the next paper, an abstract of it was read by the author. The paper was entitled—

REMARKS ON EXPERIMENTS WITH THE OINTMENT BASES.

By W. WILLMOTT.

An invitation to deal with the subject of ointments has appeared the Conference List* for some time past. I beg, therefore, to offer the following remarks; not, however, as a complete answer to the question propounded in the invitation, but rather as setting forth the results of my own experience in this field of research.

Ointments and ointment bases have, it is true, already been much and ably commented upon; yet they are well worthy of further consideration and discussion; for although ointments have been called “barbarous” applications, and are, it must frankly be confessed, the reverse of pleasant or agreeable remedies, yet it is undeniable that they afford relief—and often great and curative relief—in some of the most painful and distressing maladies known to medical science. That an endeavour should be made, under these circumstances, to impart to such preparations the best qualifications for successful remedial use, together with the highest pharmaceutical perfection, seems sufficiently obvious. There are, perhaps, no remedies, whether external or internal, which, pharmaceutically, will better repay any extra time or attention devoted to them; and yet, practically, there are none which, until within a comparatively recent date, have been so systematically neglected. To meet with an ointment entirely free from rancidity, and not discoloured or otherwise injured by age or keeping, was formerly rather the exception than the rule; but, happily, this is no longer the case, as now the best means are unceasingly sought for securing the very desirable qualities of efficiency and stability.

What, it may be asked, are the special points which commend themselves to our notice in a properly prepared unguent? They are chiefly the following:—colour, consistence, smoothness, neutrality, and freedom from rancidity or from liability to acquire that condition. A word or two with reference to each of these may not be out of place.

Colour.—In the majority of instances the colour of a recognised

* “Subjects for Papers.”

official ointment is determined by the active ingredient with which it is mixed, and from which it takes its name. Thus, one ointment is red, a second yellow, a third black or brown, and so on, these colours indicating to some extent correctness of character and condition. On the other hand, there are ointments which are without colour (*i.e.*, distinctive colour), and where this is the case, it cannot be denied that an appreciative predilection finds its expression in the term "beautifully white."

As a point in connection with this much desired whiteness, we are directed by the British Pharmacopœia in nearly every case where the melting process is adopted in the preparation of an ointment, to stir constantly until cold, or until the mixture solidifies. This constant stirring is undoubtedly important, although, perhaps, on account of its tediousness, it is seldom strictly carried out. It is well known that by the beating, whipping, or stirring of colourless mixtures of fatty substances, more or less whiteness and lightness are secured, the effect being produced by what has been called "the molecular interposition of the atmospheric air." By this means also smoothness and softness are promoted, and the "beauty of the product" is correspondingly enhanced.

Consistence.—In practice the consistence of an ointment is essential to its proper application. If too soft it is not well adapted for surgical use, and if too firm it lacks the quality necessary for the anointing of inflamed surfaces, etc. It is desirable, therefore, to have at command one or more bases fulfilling each of these conditions, so that the requirements of both surgical and medical practice may be fully met.

Smoothness.—The quality of smoothness in an ointment scarcely needs comment. All will agree with Professor Redwood, that the presence of hard particles therein is very objectionable, and indicates want of skill or of careful attention in the dispenser.

Neutrality.—By neutrality is indicated that condition in the basis which leaves it without medicinal action of any kind. This condition is of essential importance, whether such basis be employed for the conveyance of active agents, or simply as a means of excluding the air. What is required is a non-irritant in the strictest sense of the term.

Freedom from Rancidity.—That ointments should be free from rancidity is a self-evident proposition, and one, moreover, which is conceded by all. Any substance, therefore, which is not liable to change by keeping must perforce possess a special value for the pharmacist, and it is simply stating a truism to say, that in all

recommendations of particular substances to be used as ointment bases, this quality of resistance to oxidation is more or less enforced: it is, perhaps, the standard by which we may best estimate the relative value of the several bases which from time to time have been, and are, employed in the making of this useful class of preparations.* The tables given in this paper are directed more especially to this end.

To meet the several requirements thus enumerated, we have in reality but few substances known as bases, either simple or compound. These may really be said to be but three in number, viz., lard, oil, and wax, and the mineral hydrocarbons. Many "substitutes" of value and merit have been proposed, such as glycerine in combination with starch and with fuller's earth; pigmentum album, honey, glycelæum, shea butter, the oleates and oleo-palmitates, and so forth; but as none of these, although well meriting the fullest attention, have come into extensive use, they need not in this contribution be further referred to.†

Of the three above-named bases, lard has hitherto been the most generally available, and though it may be thought an advantage if, on account of its proneness to change, it could be dispensed with entirely in connection with pharmacy, it is evident that in view of our present requirements this cannot be done.

It will be my endeavour, therefore, to show the relative value of this substance as compared with that of oil and wax, and the petroleum residues, and this, I think, will be most clearly made manifest by stating results in the form of a series of tables which for the most part will speak for themselves. It may be premised, that as regards the therapeutic action, if any, of these three bases, there is, in reality, nothing to choose between them. Given pure and well-conditioned products, and all are equally applicable for external medication.‡ At the same time, to ensure this result

* "One of the most, if not the most, important points in the making of ointments is that they should be so prepared as to keep as long as possible without becoming rancid."—A. F. Haselden, *Pharm. Journal*, December 1, 1863.

† A specimen of Mr. Schacht's "Plasma" (*Glycerinum Amyli*), prepared February 27, 1879, and preserved in a stoppered bottle, is, at the present date, absolutely perfect.

‡ A suspicion, not altogether groundless, exists with regard to the petroleum residues, that they are the source of considerable mischief in a certain percentage of severe cases. As a question of preference, there could not, perhaps, be a better unguent basis than *oil and wax*; and regarded as a soothing admixture of this character, the "*unguentum cetacei*" of the London Pharmacopœia, composed of olive oil, wax, and spermaceti, may be said to be wholly unsurpassed.

careful preparation in each instance will be found necessary. How is this best to be accomplished in the case of lard, the basis which we have first to consider?

The simple plan is, of course, melting and straining; but, besides this, two processes of a somewhat special character have been introduced. One, that of the Pharmacopœia, which may be described as a process of washing and straining; and the other, that of Mr. Edward Smith, which, in addition to washing, insists upon *filtering* as a *sine quâ non*.* Both these processes are excellent in theory, but, truth to say, possess no advantage in practice. The washing on the one hand, and the filtration on the other, involve conditions which appear to counterbalance any advantages which may result from their adoption. Much decomposable matter, it is true, is removed in the process of washing as directed by the Pharmacopœia;† but the heat required subsequently to get rid of the water is prejudicial to the stability of the product. In Mr. Smith's process, also, the sustained temperature necessary for filtration, though not greatly above 100° F., seems detrimental to the keeping properties of the lard so treated;‡ whilst the removal of all traces of water by the plan proposed by that gentleman, is scarcely so easy of accomplishment as his description would seem to imply. It must, indeed, be conceded, that both processes give unexceptionable products as prepared specimens; but it still remains, that the pure article of commerce, which may be purchased in any quantity, is sold, not as "Pharmacopœia" lard, or as "filtered" lard, but simply as a "clarified" preparation.§

The following statement will show the extent of stability of lard when subjected to different methods of treatment:—||

* "Proceedings of the British Pharmaceutical Conference," 1869, p. 26.

† As an experiment portions of the water so used were *filtered quite bright*, and set aside. Within four days decomposition had commenced, and at the completion of a week all the specimens were in a thoroughly bad and offensive condition.

‡ "I believe the secret of making good sweet lard depends upon the small quantity of heat employed in the melting."—A. F. Haselden, *Pharm. Journ.*, December 1, 1863.

§ Mr. Edwards informs me, that his "clarified" lard is invariably *washed*, and certainly, like the Pharmacopœia product, it is a white, smooth, and most excellent preparation; but the question remains, Is prepared lard, in consequence of washing, less liable to rancidity than that which has simply been melted and strained? My experience seems clearly to indicate that it is not.

|| Owing to the pressure of other work, more detailed observation could not be made. This applies also to the remaining tabular statements, which, in consequence thereof, are not given in quite so complete a manner as could be wished.

Adeps Præparatus.

No. 1. Bladder lard	}	Rancid within 18 months.	
No. 2. Ewen's "pharmaceutical"			
No. 3. Ewen's "pharmaceutical" filtered			
No. 4. Ewen's "pharmaceutical," benzoated		Rancid within 5 years.	
No. 5. "Flare" melted and strained	}	13 months. {	Good.
No. 6. "Flare" melted and filtered			
No. 7. "Flare" washed and strained (B.P. process)			Rancid.
No. 8. "Flare" washed and filtered (Mr. Smith's process) . . . . .				Slightly rancid.

Taking now Nos. 5, 6, 7, and 8 as having been under observation *ab initio*, and testing them in the form of ointments, two of which are of all others the most liable to rapid deterioration (and for this reason frequently used in these experiments as a test of stability in the basis), we find results of a corresponding character to the above.

UNGUENT.	ADEPS PRÆPARATUS.			
	No. 5. Strained.	No. 6. Filtered.	No. 7. Washed and Strained.	No. 8. Washed and Fil- tered.
HYD. OX. RUB.				
1 month .	Good.	Slightly rancid.	Rancid.	Rancid.
3 months .	Rancid, dark colour.	Rancid, dark colour.	Rancid, dark colour.	Rancid, dark colour.
13 months .	Ditto.	Ditto.	Ditto.	Ditto.
PLUMB. CERE.				
1 month .	Good.	Rancid.	Rancid.	Rancid.
3 months .	Rancid.	Ditto.	Ditto.	Ditto.
13 months .	Ditto.	Ditto.	Badly rancid.	Badly rancid.
ZINC.				
1 month .	Good.	Good.	Good.	Good.
3 months .	Ditto.	Ditto.	Slightly rancid.	Indifferent, mouldy smell.
13 months .	Ditto.	Ditto.	Rancid.	Badly rancid.

It would appear, therefore, that washing and straining, or washing and filtering, necessitating, as they do, a more or less sustained temperature of 100° to 212° F., are without advantage in the preparation of lard for use as an unguent basis. On the contrary, the

best results seem to rest with the simple process of melting and straining. But, in any case, the condition of rancidity in lard is soon developed. This, however, is obviated to a very large extent by the use of benzoin, and from the marked preference given to "benzoinated lard" in the United States Pharmacopœia (the new edition), to the entire exclusion in the ointment series of the mineral hydrocarbons, as well also as from its adoption by our own authorities, it may be assumed that this well-tried basis (*viz.*, lard), whether plain or benzoated, is still considered by physicians and pharmaciens of the day an essentially valuable ingredient in pharmaceutical manipulation. In a tabular statement presently to be given, further reference is made to the "*adeps benzoatus*" of the British Pharmacopœia.

OIL AND WAX.*

The ointment basis formed by the combination of oil and wax may be considered to include all those artificial mixtures of fatty substances of which the "simple ointment" of the British Pharmacopœia is the representative. The advantage of such a basis is, that any consistence can be obtained, from the firmness of a cerate to the softness and thinness of oil itself. As a simple application for wounds or inflamed surfaces, this very useful combination possesses a purely negative, though essentially protective, effect. The one objection is, as in the case of lard, the liability to become rancid; though if yellow or unbleached wax be used, a very permanent condition is secured. A careful review of the following statement will show this to be the case:—

CERATES AND OINTMENTS (SIMPLE).

G=good. R=rancid. B.R.=badly rancid.

Cerates.

	Two years.	Four years.
Cera alb., 1; Ol. amygd., 1	R.	
Cera alb., 1; Ol. olivæ 1†	G.	R.
Cera flav., 1; Ol. amygd., 1	G.	G.
Cera flav., 1; Ol. olivæ, 1	G.	G.
Cera alb., 4; Ol. olivæ, 10; Cetaceum, 1‡. . . .	G.	B.R.

* "I believe there is no better basis for ointments than the linimentum simplex of the Edinburgh Pharmacopœia, which consists of white wax and olive oil."—Squire, in *Pharmaceutical Journal*, December 1st, 1863.

NOTE.—For Mr. Squire's present views on this point, see his valuable "*Companion.*"

† Ceratum, P.L.

‡ Ceratum Cetacei, P.L.

Ointments.

	Two years.	Four years.
Cera alb., 3; Ol. amygd., 5	R.	
Cera alb., 3; Ol. Olivæ, 5	G.	R.
Cera flav., 3; Ol. amygd., 5	G.	G.
Cera flav., 3; Ol. olivæ, 5	G.	G.
Cera alb., 2; Ol. olivæ, 20; Cetaceum, 5*	G.	R.
Cera alb., 2; Ol. amygd., 20; Cetaceum, 5†	G.(?)	B.R.
Cera alb., 1; Adeps præp., 6; Cetaceum, 2‡	B.R.	
Cera alb., 2; Adeps præp., 3; Ol. amygd., 3§	B.R.	
Cera alb., 1; Adeps præp., 12; Vaseline, 3	B.R.	
Cera alb., 3; Ol. amygd., 4; Vaseline, 1	R.	
Sevum præp., 6; Ol. amygd., 3; Vaseline, 1	B.R.	

The unbleached wax imparts colour, and also a pleasant odour, and hence, perhaps, its very stable character. If *whiteness* be an object, this substance in its unbleached state, cannot, of course, be used.|| The behaviour of oil and wax as a basis for the official ointments is given a little further on.

THE MINERAL HYDROCARBONS.

The introduction of the mineral hydrocarbons for the purpose of external medication has brought with it many changes in some of our accustomed formulæ. These mineral substances are said to be antiseptic in their effect, and as a chief recommendation it is strongly claimed for them that they are free from the objection which obtains in the case of the two bases we have been considering, viz., liability to change by oxidation. The names given to these hydrocarbons are well known to us as cosmoline, fossiline, ozokerine, vaseline, etc., the “ine” being a popular and euphonious affix which has of late been somewhat indiscriminately applied. It is not my intention to determine the *inclusive* merits of these several substances, but I give in tabular form the results of my observation, the comparison showing quite an appreciative difference in their behaviour when time has been allowed to exercise full influence over them. One important drawback to vaseline, to which preference in practice has heretofore been given, is its liability to develop a strong petroleum-like odour, which is scarcely less objectionable than actual rancidity. Melted with paraffin, white wax, or spermaceti, and especially with paraffin, or in the presence of carbonate or acetate of lead, this odour

* Unguent. cetacei, P.L.

† Unguent. cetacei, B.P.

‡ Unguent. cetacei, Ph.D., 1826.

§ Unguent. simp., B.P.

|| The colour of yellow wax mixed, to form a simple basis, remains unimpaired after many years.

is strongly developed. In combination, however, with *yellow wax* it is entirely prevented.* On the other hand, the palm must be awarded to vaseline for the retention or preservation of its original colour.

Objections have been entertained to the above mineral products on the ground of their great softness. "We want," said a physician to the Hospital for Diseases of the Skin, "an ointment not a lini-ment." It is, of course, quite competent to add wax, paraffin, or spermaceti in any quantity that may be desired, but this may be thought both troublesome and inconvenient, as, in the absence of a certain requisite amount of physical labour, there may result a want of that smoothness which is so desirable in a basis of this character.

VASELINE, FOSSILINE, OZOKERINE, AND CHRISMA.

(Length of trial, 2 years.)

Unguent.	Vaseline.	Fossiline.	Ozokerine Alb.	Chrisma.
UNG. PLUMB. ACET.	Strong petro- leum odour. Transparent oily separa- tion on sur- face. Colour good.	O d o u r l e s s . Soft. Dark mahogany c o l o u r . Opaque mud- dy appear- ance.	Slight odour of petroleum. Very soft and oily. Some- what trans- parent in ap- pearance.	Similar to fos- siline, but de- cidedly the better of the two.
UNG. PLUMB. CARB.	Powerful pe- troleum odour. Oily layer on sur- face. Colour light.	F r e e f r o m o d o u r . Orange yel- low colour, u n i f o r m throughout.	Colourless. Very soft. Entirely free from rock oil odour.	Colour a little lighter than fossiline. Slight separa- tion of oily globules below surface.
UNG. HYD. OX. RUB.			Colour bright. Very soft. H o n e y- combed ap- pearance be- neath sur- face.	

NOTE.—From whatever source fossiline and chrisma are derived, the two appear to undergo similar treatment in their production and preparation.

* This pungency or rankness, which, in the absence of chemical examination, has been assumed to arise from the presence of traces of crude petroleum, and, hence, so described, is developed to some slight extent in ozokerine, but not at all, under any conditions, in either fossiline or "chrisma," a circumstance which imparts to these latter an advantage deserving of the fullest consideration.

VASELINE,* WITH PARAFFIN, WAX, AND SPERMACETI.

(Length of trial, 3 years).

Unguent.	Vaseline 2. Paraffin 1.	Vaseline 2. Cera Alb. 1.	Vaseline 2. Cera Flav. 1.	Vaseline 2. Cetaceum 1.
" CERAT. PETROLEI."	Very appreciable rock oil odour. Slightly granular appearance. No change of colour.	Waxy consistence. Opaque. Slight paraffin odour. Colour unchanged.	Pleasant smell of beeswax. Firm, good consistence. Smooth and uniform throughout.	
UNG. PLUMB. CARB.	Rank, disagreeable odour. Dark on surface, light beneath. Good consistence. Smooth.	Similar to vaseline and paraffin, but of uniform light yellow colour.	Odour of beeswax. Good in all respects.	Similar to vaseline and cera alb., but preferable in appearance.
UNG. HYD. OX. RUB.	Uniform bright colour. Granular appearance. Quite perceptible rank odour.			Similar to vaseline and paraffin, but less granular in appearance. Soft consistence.

Whichever of the hydrocarbons or their respective "cerates" may be selected for adoption, it is at least a fair opinion that they cannot be credited with improving the appearance of the pharmacist's stock. Not unfrequently they produce granular, greenish-looking, oily compounds, which have nothing about them calling for a just appreciation of their real merits. If "a good appearance is the first letter of recommendation," we certainly do not find here the full value which the trite sentiment conveys.

I must here specially notice a particular preparation of this class, known as "white ozokerine," or ordinary ozokerine "made absolutely white," on the very plausible assumption that it would be "more appropriate to its purity and suggestive of its virtues." It is described as "a pure hydrocarbon, with formula $C_{85}H_{13}$, or thereabouts, obtained in the distillation of the solid paraffin ozokerite, and analogous to the new American substance vaseline." My atten-

* Vaseline is here used as being the most familiar of this class of preparations.

(Length of trial, eight months.)

UNGUENT.	Vaseline and Wax.		Ozoker. Alb. and Wax.		Olive Oil and Wax.	
	Vaseline 5. Cera Alb. 1.	Vaseline 5. Cera Flav. 1.	Ozoker. Alb. 5. Cera Alb. 1.	Ozoker. Alb. 5. Cera Flav. 1.	Ol. Olive 5. Cera Alb. 1.	Ol. Olive 5. Cera Flav. 1.
UNG. SMP. . . .	Slight petroleum odour; otherwise good.	Good in all respects. Pleasant smell of beeswax.	Odourless. Uniform bluish-white tinge.	Similar to vaseline and cera flav.	Good. Better in appearance than the petroleum specimens.	Similar to ol. olive and cera alb.
UNG. PLUMB. ACET. .	Strong rock oil odour. Colour light below surface. Smooth and transparent.	Colour indifferent. Pleasant odour of beeswax.	Indifferent. Dirty bluish-tinge. Odourless.	Similar to vaseline and cera flav., but lighter in colour and less transparent.	Badly rancid after six months, the change commencing within five weeks.	Similar to ol. olive and cera alb. Dark, dirty appearance.
UNG. PLUMB. CARB. .	Paraffin odour. Slight separation of oily globules. Smooth. Colour not uniform.	Similar to vaseline and cera alb., but free from paraffin odour.	Odourless, and in all respects good.	Good in all respects. Pleasant odour suggestive of perfume.	Rancid within six months. Clean and white throughout.	Fairly good after six months, but rancid within eight months. All colour lost.
UNG. HYD. OX. RUB. .	Colour good. Odourless.	Good in all respects.	Colour good. Odourless.	Good. Faint hay-like odour, suggestive of perfume.	Rancid. Colour changed on surface.	Similar to ol. olive and cera alb.

* Vernacular terms and medical Latinity are used in all cases arbitrarily, as suggested by convenience.

tion was enlisted on behalf of this speciality by the following letter from Professor Bloxam, of King's College :—

“DEAR SIR,—Will you kindly allow me to introduce to you my friend Mr. Edmund Field, who desires to submit for your consideration a new preparation, white ozokerine, which is, from a chemical point of view, all that could be desired as a simple create or unguent.

“Very faithfully yours,

“C. L. BLOXAM,

“*Professor of Chemistry, K.C.L.*”

In accordance with this request I subjected the sample left in my hands to a sufficiently severe test in the form of the red oxide of mercury, and carbonate and acetate of lead ointments, and the result, so far as the comparatively short period at my command would allow, was satisfactory. As against vaseline it fairly held its own, and, like vaseline, far out-distanced in durability of condition the mixed basis of oil and wax. This result is clearly shown in the table on page 507.

White ozokerine has the merit of being free from colour; but it is too soft for general use without the admixture of some solid fatty substance, such as wax or paraffin. In this form I shall have occasion to speak of it again before concluding my paper.

As a fair test of the stability, and, therefore, to this extent, of the relative value of the three bases herein adopted for consideration (which, as we have seen, are those readily available for use and now commonly employed in practical pharmacy), six of the official ointments were each carefully prepared with different varieties or subclasses of such bases (making forty-eight specimens in all), and on examination at irregular, and, through pressure of work, sometimes long intervals, gave the results shown in the table on the opposite page. I may add that the process of oxidation in fatty substances being slow and insidious in its progress, the change is not easy of detection at its commencement.

The prominent feature in this table is the great superiority of unbleached wax and olive oil, and the permanence of the mineral hydrocarbon vaseline, always excepting the development of the objectionable odour peculiar to it, which appears to be due to the particular process employed in its preparation; a process which is claimed as being exclusively applied to this variety of the petroleum residues.

It will be observed, that in these trials all the lards gave way

EXPERIMENTS WITH OFFICIAL OINTMENTS.

Explanation.—Where there is no rancidity, the term “good” is used; whilst degrees of rancidity are, as far as possible, indicated by the terms “slightly,” “quite,” “very,” and so on.

UNGUENT. Intervals of Observa- tion.	Lard.				Oil and Wax.			Petroleum.
	Ordinary.	“Pharmaceuti- cal.”	Filtered.	Benzoated.	Ol. Amygd. ... 2. Cera Alb. 1.	Ol. Olive 3 Cera Flav. 1	Ol. Amygd. 6. Cera Alb. 4. Vaseline 2.	
UNG. GALLÆ. 14 “ 2 YTS. 4 “	Good.	Good.	Good.	Good.	Good.	Good.	Good.	Good.
	Slightly rancid.	Slightly rancid.	Slightly rancid.	“	Doubtful.	“	Doubtful.	“
	“	“	“	“	“	“	Slightly rancid.	“
	“	“	Distinctly rancid.	“	Distinctly rancid.	“	Distinctly rancid.	“
UNG. HYD. OX. ROB. 6 “ 14 “ 2 YTS. 4 “	Rancid.	Rancid.	Rancid.	Good.	Good.	Good.	Good.	Good.
	“	“	“	Rancid.	“	Slightly rancid.	“	“
	“	“	“	“	“	Quite rancid.	“	“
	“	“	“	“	“	Very rancid.	“	Rank odour. Colour good.
UNG. PLUMB. ACET. . . 14 “ 2 YTS. 4 “	Rancid.	Rancid.	Rancid.	Good.	Good.	Good.	Good.	Good.
	“	“	“	Rancid.	Doubtful.	“	Rancid.	Rank odour.
	“	“	“	“	Slightly rancid.	“	“	“
	“	“	“	“	Quite rancid.	Rancid.	“	“
UNG. PLUMB. CARR. . . 14 “ 2 YTS. 4 “	Rancid.	Rancid.	Rancid.	Good.	Good.	Good.	Good.	Good.
	“	“	“	Slightly rancid.	Rancid.	Rancid.	Rancid.	Rank odour.
	“	“	“	Quite rancid.	“	“	“	“
	“	“	“	“	“	“	“	“
UNG. SUL- FUR . . 14 “ 2 YTS. 4 “	Good.	Good.	Good.	Good.	Good.	Good.	Good.	Good.
	Rancid.	Rancid.	Rancid.	“	Rancid.	Rancid.	Rancid.	“
	“	“	“	Doubtful.	“	“	“	“
	“	“	“	Rancid.	“	Doubtful.	“	“
UNG. ZINCI 6 “ 14 “ 2 YTS. 4 “	Good.	Good.	Good.	Good.	Good.	Good.	Good.	Good.
	Doubtful.	Doubtful.	Doubtful.	“	Slightly rancid.	“	Rancid.	“
	Rancid.	Rancid.	Rancid.	“	Quite rancid.	“	“	“
	“	“	“	“	Strongly rancid.	Rancid.	“	“

N.B.—In all cases rancidity goes from bad to worse; so also the rank odour developed in vaseline.
Note.—The exact condition, as regards soundness, of Ung. Gallæ in the above, was very difficult to determine.

early, with the exception of the "benzoated," which, in the presence of lead and mercury (a severe test), retained its soundness for something like twelve months; whilst ung. zinci and ung. gallæ when benzoated were found in an almost perfect condition at the end of four years. Benzoin, though a powerful preservative of fatty substances, should, perhaps, be introduced into these preparations as sparingly as possible, since in special, though it may be exceptional, cases, owing to the local irritation which might possibly be set up, the intended good may be counterbalanced by more or less avoidable mischief.

Attempts to mix the petroleum residues with lard and oil of almonds, etc., on the ground of the supposed antiseptic properties of the former, were not successful. Equal parts of lard and vaseline became badly rancid within two years; and, similarly, different proportions of oil of almonds with white wax and ozokerine, or vaseline, all gave way either sooner or later. A largely preponderating proportion of the hydrocarbon would be required to prevent all change in semi-solid, oleaginous mixtures of this description. When these mixtures contain lead or mercury, decomposition sets in very quickly. A few examples may here be given:—

Ung. Plumb. Carb.

Bases.	Ozokerin 3.	Cera alb. 2.	Ol. amygd. 1	} All rancid within four months.
	Ozokerin 3.	Cera alb. 2.	Adeps 3	
	Ozokerin 1.	Adeps 3.		
	Vaselin 1.	Adeps 3.		
	Paraffin 2.	Adeps 3.	Ozokerine 3	

Substituting mercury for lead, the above experiment was repeated with precisely similar results, rancidity commencing in both instances within three or four weeks from the date of preparation. In the single specimen of the second group in which lard was absent, the colour of the red oxide (the preparation used) was found bright and perfect at the end of fifteen months.

These "remarks" would scarcely be complete without a brief allusion to three specially prominent ointments which have proved very troublesome, and, it may be added, unsatisfactory, to the working pharmacist. The first of these is the diachylon ointment of Hebra. It might be quite worth while to consider the exact conditions of success in the process of boiling together water, oil, and oxide of lead, if it were not that we have in the petroleum hydrocarbons so good an agent for removing all difficulties out of the way, and insuring the most complete success. Made with equal parts of one of these prepared petroleum residues and lead plaster,

the result is satisfactory in every way, and an excellent unguent is certainly, and in the easiest possible manner, obtained. The plaster should be recently prepared, and the minimum of heat employed in melting it down. Very little stirring will be needed while the mixture is cooling. I have had under observation three specimens of this ointment, which were prepared on June 20th, 1879, *i.e.* more than four years ago. No. 1 was made with vaseline; No. 2 with chrisma; and No. 3 with ozokerine. As a result the colour is best maintained by the vaseline—a property of this substance already referred to—the fine odour of the oil of lavender is by far the best preserved by the chrisma (formerly called ung. petrolei); whilst the ozokerine specimen, without being very bad, is decidedly inferior in both these respects to the other two. All are more or less granular and lumpy; the chrisma preparation, however, being the least so of the three. Made with *olive oil* and lead, plaster ung. diachyli becomes rancid within a few months.

The second of the three ointments claiming a brief notice is that of boracic acid, frequently called "boric ointment." This, as is well known, was introduced by Professor Lister, of King's College Hospital. The original formula for the full strength runs precisely as follows :—

[illegible]

Melt the paraffin and white wax together, add the almond oil, and mix well; then add the boric acid finely levigated, and *stir well till cool*.

Divide the mass into small pieces, and then bruise and mix well in a mortar.

Sig. Boric ointment full strength.

When well managed, *secundum artem*, this formula yields a "beautifully white" product, both smooth and firm. It was a special favourite in the practice of the late Dr. Tilbury Fox, and was the more appreciated as it left no glistening layer of oil or grease on the surfaces to which it was applied. It was found, however, that its proper condition could not be depended upon for more than a few months; and this being so, a new basis, composed of vaseline and paraffin, for which we are indebted to Mr. Martindale, was submitted for authoritative approval, and, having received full assent, was thenceforward substituted for the wax and oil. This basis,

"cerat. petrolei," except that it sacrifices appearance to utility, successfully resists all change for a considerable time; not, be it said, indefinitely, for ultimately (*e.g.* within three years) the rank odour peculiar to Vaseline, and already fully commented upon, becomes freely developed. If, being a mineral product, it is necessary to use solid paraffin to the exclusion of yellow wax, probably chrisma or white ozokerine may be advantageously substituted for the vaseline; though, here, it will be necessary to give full consideration to any difference in effect resulting from their use which experience may point to as a possible or probable contingency. It will be noted that in the above formula we are especially instructed to "stir till cool." The subsequent labour, however, of reducing to smoothness will be considerably lightened (*i.e.*, in the case of the basis itself, which might be first completed) by allowing the mixture to cool *without* stirring; and, obviously so, as in such a case the paraffin, regardless of its high melting point, will be uniformly and perfectly distributed through the mass, and thus made easily manageable under an ordinary palette-knife. I may say, that for the smoothing process the pestle and mortar is of very little use; what is required is a large marble slab presided over by a zealous operator not sparing of his labour. Prepared thus, boric ointment forms a very efficient application, and is largely prescribed both in private and hospital practice.

Lastly, then, I have to notice the almost played-out, but ever-diversified and perplexing unguentum hydrargyri nitratis. I refer to this chiefly because a new theory of its early deterioration has been propounded by Mr. Maben; namely, that the reduction of the mercury is caused (and, we must presume, solely caused) by the action of some foreign oil added to the olive oil as an adulterant.* There can be no doubt, I think, that the oil is the chief agent in the production of this change when consideration is had to the quantity of nitric acid with which it is in part combination; but I should prefer to regard it rather as a question of degree between the olive oil on the one hand, and the foreign oil on the other, than as a question of change with the latter, and no change at all with the former. It will be convenient to adopt the hypothesis that various oils possess in different degrees, in the presence of heat, the power of breaking up the nitric acid, and that this power is possessed by olive oil to a comparatively small extent only. A larger proportion of acid being thus retained in its normal condition, the reduction of

* Vide *Pharm. Journ.*, April 21, 1883.

the mercury is for the time being prevented.* But still less is this power possessed by lard alone, for here, so far as my observation extends, there is no subsequent deterioration in point of colour whatever, and to this extent, perhaps, the U. S. formula is a step in the right direction. It must not be overlooked that Mr. Maben's position is strengthened, or apparently so, by the circumstance that in heating a specimen of ointment prepared with pure olive oil to 300° F., he found no change of colour. This test, however, is scarcely sufficient. A better one would be to take a somewhat lower, though increasing, temperature, and prolong it for fully half an hour. If this be done, I think it will be found, that in spite of the pure olive oil the ointment will change to a deep brown, and an unmistakable layer of mercurous oxide will be deposited in the containing vessel. I have spoken of the quantity of nitric acid ordered for use. It is well worth noting that if this be increased to three-fifths of the weight of the oil and lard combined, all change is prevented, a circumstance which is very significant as regards the prominent influence exercised respectively by the acid and the oil. Allowing full weight to the latter, the conclusions arrived at by Mr. Schacht, from able experiments conducted many years ago, appear to retain their validity to the present time.

A word as to temperature. Mr. Maben reflects on the authors of the Pharmacopœia for their indefiniteness on this point, whilst he himself is sufficiently obscure in the same direction. The expression "heated to" is clear enough, but "prepared at" is, here, not quite so obvious. What does Mr. Maben mean by the ointment being "prepared at" 180°, 212°, and 300° F.? The truth is, this ointment cannot be *prepared* (which, of course, includes the entire process) at any given temperature. What really occurs (and I am not aware that any writer has yet drawn attention to the point) is this: supposing the temperature to be kept below 180° F., there is no frothing, but the process proceeds very slowly for several days, and the ointment so prepared is of soft consistence and very light

* In reproducing Mr. Maben's experiments, I did not get precisely similar results; for instance, the 10 per cent. rape oil admixtures produced excellent ointments at both temperatures, the bright yellow colour being fully retained to the present time. Using *rape oil alone* with the acid solution mixed at 212° F., the colour was also good, but changed to greenish yellow within three weeks. In this latter case the action was more energetic and the temperature attained slightly higher than when pure olive oil was used. This would seem to indicate greater disturbance of the nitric acid, and, as already intimated, may furnish a sufficient reason for its being more readily parted with. The rape oil specimen was soluble in ether similar to Mr. Maben's "B" experiment with the pure oil.

in colour. If the mercurial solution be added to the oil and lard heated in a water-bath to 180° F., there is but little change for the moment; but when the temperature reaches 200° F., or a degree or two higher, frothing commences, and the heat then rises with comparative rapidity to 255–265° F., as the highest frothing point, Assuming now that the solution is added to the oil and lard at 212° F., the effervescence begins at once, and the mercury then runs up, as in the former instance, to 265–270° F., a difference only of about 5 degrees in the two cases. With the acid solution mixed in at 300° F., the action is so energetic that the heated liquid is thrown violently out of the vessel, and all around, to the dismay and very probable discomfort of the operator. Under the circumstances, the directions of the Pharmacopœia appear to be sufficiently definite, inasmuch as they secure the frothing up of the mixture, and its consequent exposure to the influence—whatever that may be—which at least 250 degrees of Fahrenheit may have upon it.

Whilst on the subject of “citrine ointment,” it may be useful to refer to a troublesome feature in connection with its admixture with lard to form the Ung. Hyd. Nit. Mitius of the London Pharmacopœia. It is well known that “citrine ointment,” especially when recently prepared, cannot be so mixed without quickly acquiring a leaden hue, owing to the rapid reduction of the mercury. To the pharmacist who is attached to his work, and who conducts his processes *con amore*, this is simply intolerable. The difficulty, however may be met by adding to each ounce of the lard from 10 to 30 minims of peroxide of hydrogen, or ozonized ether. This is both harmless and efficient, but it has the disadvantage of developing in the ointment a sharp, pungent odour, something approaching to rancidity. Fortunately a still better remedy is at hand, viz., the mixture before referred to, of ozokerine alb., and white wax. This appears to be the only substance which successfully resists the change alluded to. Paraffin cannot be used, vaseline is altogether unsuitable, and yellow wax of course imparts colour; but white ozokerine and white wax—2 parts of the former and 1 of the latter—prepared *s. a.* and reduced to perfect smoothness on a marble slab, together form a basis applicable not only to the above, but to a number of small things in the pharmacy of a similar description, where the absence of colour and the presence of permanence and stability are especially to be desired.

It remains only to state that I have endeavoured in this contribution to avoid all needless technicality, and to confine my remarks to a simple and unvarnished statement of personally observed

facts, as viewed from a pharmaceutical standpoint of present and progressive utility.

The PRESIDENT said a special vote of thanks was due to Mr. Willmott for his intelligent and patient work, now extending over several years, and for this paper, which was full of interest to every pharmacist.

Mr. WILLIAMS asked whether the white wax referred to was that usually employed in pharmacy, or what he should call white wax; because they were very different things. The white wax of pharmacy was understood to contain about two parts to one of spermaceti.

Mr. WILLMOTT said he endeavoured as far as possible to carry out his experiments with the materials usually used in the pharmacy. There were very few cases where special kinds of wax would be obtained, and therefore he used the ordinary ingredients.

Mr. MASON said he presumed he referred to the ordinary round cakes of commercial white wax.

Mr. WILLMOTT replied in the affirmative.

Mr. WARD (Leeds) asked if Mr. Willmott had made any examination of the different kinds of hydrocarbons, known under different names, in order to prove their identity or otherwise. There were several of these articles presented under different names, and if it could be determined that they were substantially all of the same composition, it was very desirable that that should be known.

Mr. WALTER HILLS asked if Mr. Willmott had made any experiments in the bleaching of white wax, or did he consider that the somewhat unpleasant odour which attached to white wax was unavoidable. He had often thought that if white wax could be obtained as pleasant in odour as yellow wax, it would be very important. The vaseline basis and the lard basis might be used for very distinct purposes, as had been shown by Mr. Martindale: vaseline being more suitable for external application as a kind of shield, whilst lard was more suitable where absorption was required.

Mr. MOSS wished to express his obligation to Mr. Willmott for the extremely useful manner in which he had handled this subject. He should have been glad if Mr. Willmott's conclusions had been somewhat different, because they combated some conclusions of his own, particularly with reference to vaseline. Mr. Willmott's main conclusion appeared to be that vaseline was not so unalterable as it

had been stated to be, and not so good as several other ointment bases to which he had referred. Some few years ago, being then somewhat identified with vaseline, he (Mr. Moss) had made experiments, embracing all the ointments in the Pharmacopœia, and in no one instance did he find the petroleum odour become developed. He would like to ask whether Mr. Willmott made all his experiments with the same sample of vaseline, because it was just possible that one specimen might not be so thoroughly purified from those paraffins which were associated with it originally. With regard to the composition of vaseline and ozokerine, they were both hydrocarbons, but differed physically to a considerable extent, which he was quite unable to explain, save that they came from different parts of the world, and had stamped on them certain impresses which were not recognisable by chemical means.

Mr. NAYLOR asked in what manner the initial stage of rancidity was ascertained. He also was a little disappointed with the conclusions arrived at, his own experiments being quite confirmatory of the results just stated by Mr. Moss. That might be accounted for by the fact that his experiments were all made at the same time as those of Mr. Moss, and he believed from the same specimen of vaseline. With reference to the composition of these hydrocarbons, he had examined five or six, and the only real difference between them was that while they all contained hydrocarbons of the same series, they belonged to different parts of the series.

Dr. SYMES said he could to some extent confirm the statement made by Mr. Willmott, that vaseline did not always retain after keeping the freedom from odour which it possessed in the first instance. Some seven years ago, when vaseline was not so well known, he put up a glass jar containing a specimen of it in his pharmacy, where it could be seen by medical men. A gentleman present at that meeting, happening to come in, took the lid off and remarked that it smelt quite acid. He forgot to remove it, and the specimen remained, until one day the representative of the proprietors of vaseline entered his pharmacy, and it occurred to him to call his attention to it. Had it not been that the specimen came from a highly respectable house, the genuineness of the specimen would have been doubted by Mr. Chesebrough, and, in fact, he did express doubts about it. It was not so much the smell of petroleum as of some acid, and he thought probably in the treatment with nitric acid in the process of purification some decomposition product had remained. His experience differed somewhat from that mentioned, that these hydrocarbons did not tend to preserve sub-

stances like lard. He found, as a matter of experience, that the admixture would keep better than lard, or a mixture of oil and wax alone. There appeared to be two classes of these bodies in the market, one, petroleum jelly, obtained in purifying crude petroleum, holding a place between lubricating oil and paraffin wax, which had never been in a crystalline condition, and was therefore soft and emollient in character; and another, being that which was prepared by dissolving a soft paraffin having a low melting point in lubricating oil. These would possess different characteristics; one, being more or less crystalline, and although harder in the first instance, when broken up was quite as soft as the jelly-like body; but the two would always have distinct characteristics. He had hoped that Mr. Willmott would have made some experiments with the process recently proposed for preparing a substitute for ointments, by a solution of gelatine containing a small quantity of glycerine. He had tried it in the preparation of active remedies, such as chrysarobin, and it answered very well, retaining its consistency when painted on the skin. He thought a compound of that kind might usefully replace some of the ointments which were likely to change.

Mr. PICKARD asked if Mr. Willmott had made any experiments with the white vaseline lately introduced. The presumption would be that the white would be the purer of the two. The yellow, when heated, certainly gave off a petroleum odour; but he did not think the original samples did so much as those he had seen since. He should also like to ask Mr. Williams if what was commercially known as white wax was not in large blocks.

Mr. WILLIAMS said the wax he alluded to as pure was not known as block wax, which he believed contained other materials. It was wax which was largely used by dentists, who required to have it free from spermaceti; it was also used by photographers, and it professed to be pure beeswax, bleached.

Mr. FRAZER said he had used the wax referred to for some years, and it was known as dentists' wax. It was made by Field & Co., and other large houses, and was quite different from the ordinary white wax.

Mr. A. H. MASON remarked that what was referred to as block wax was known in the trade as Madras wax. It was not at all necessary to use manufactured or bleached wax in the preparation of ointments. Those who were in the habit of manufacturing furniture polish were aware that ordinary white wax in cakes was not at all suitable for the purpose, the Madras wax being far preferable. He should like to ask if Mr. Willmott had made experiments

relative to the colouring properties which vaseline and other hydrocarbons seemed to possess. Complaints were often heard that pomades or ointments made with them stained the skin or the linen, and he wished to know whether it might be due to a difference in the hydrocarbons, or in the case of pomades to physiological action, the colouring matter in the hair yielding to them and the pillows becoming stained. He knew a case of a lady in Paris who had used some pomade prepared with one of these bases; she had white silken hair, of which she was very proud, but after using this pomade for a few days her hair became a disagreeable yellow colour.

Mr. CONROY said, that his experience of the preparation of lard totally differed from Mr. Willmott's; he found that by filtration he got a most excellent product which would keep good and sweet. He did not consider washing to be of much use, but careful filtration was necessary to separate decomposable matter, and he had never found any difficulty in separating water after washing, because by allowing the lard to rest a few minutes, the water would sink to the bottom. There was no necessity for any length of time to be occupied in the filtration, as at a temperature of about 200° F. it would easily run through filtering paper. With regard to the petroleum odour developed by hydrocarbons, though he had prepared a great many ointments with these bases, he never noticed any development of this odour, though they certainly all developed what might be called a rancid smell, and that was developed more quickly when they were exposed to strong sunlight. He was not surprised to hear that when peroxide of hydrogen was added to an ointment it became rancid, for if he wanted to produce such a result it was just what he should do. One frequent complaint with regard to vaseline and other hydrocarbons was that they produced irritation of the skin, and he had seen children's arms in a very bad state, arising, as stated by the medical man attending the case, from the application of hydrocarbon jelly.

Mr. HOLMES trusted that Mr. Willmott would continue his researches until he had arrived at the means of making a white ointment which would not turn rancid. He had recently seen a vegetable fat sent from Singapore, which was called vegetable tallow, and it was said never to turn acid. When it was obtained white, which was not very often, he understood it made a very good ointment simply with the addition of a little olive oil, and if there were any demand for it, he thought there would be no difficulty in obtaining a supply. He had seen some of the seeds from which it

was obtained, and as they were not recognised either at Kew or the British Museum, it was obvious they were not yet known to commerce. He had a small quantity of the fat which he could place at the disposal of Mr. Willmott if he would like to experiment with it.

Mr. CONROY asked if shea butter was the same thing as vegetable tallow, and if Mr. Willmott could give any information about it, particularly as to whether it had any medicinal properties of its own.

Mr. A. C. ABRAHAM wished to dispel an idea which might arise from what had been said, that pure white wax was only used in Scotland; it was easily obtained by anybody who wished to get it. He had always used it, and believed that the firm to which he belonged had used it for as long a period as had been named (forty years). With regard to Mr. Williams's suggestion that the difference noted by Mr. Willmott was possibly due to the quality of the wax rather than to its having been bleached, his results, working with pure wax, quite bore out what Mr. Willmott had said, and the fact that white wax was oxidized by exposure to the air would lead one to expect such a result.

Mr. WARD said it would be well if it were explained whether English or foreign yellow wax was referred to.

Mr. WOOLLEY said it was very desirable that Mr. Willmott should continue this investigation, especially with regard to the wax question, as, if he had used round cakes, probably his results would require reconsideration. As regards Madras wax, the purity of a great deal of that was open to considerable doubt. The whole question of the wax to be used in ointment making might with considerable advantage be investigated further. It was rather surprising to him that one very simple thing was omitted in Mr. Willmott's paper, namely, the first preparation of the lard. He had mentioned bladder lard, but it was a very simple process to take the flake lard, and having properly bruised it, so that all the vesicles were broken up, in which condition it could be rendered at the lowest possible temperature, when the lard produced would be found to be very different from that generally used.

Mr. WHITLEY WILLIAMS thought the preparation to which Mr. Holmes had referred was very likely to be of great use indeed. He remembered some time ago being at Price's Candle Works, when Mr. Hatcher, the chemist there, showed him a quantity of a fat which he believed to be the same thing; it was imported under the name of kokum oil. He said that though freely exposed to the weather, it kept almost absolutely without change; it was a dense

white fat, something between lard or spermaceti and white wax, and in composition was almost pure stearine; in fact, it formed about the best material from which to prepare pure stearic acid.

Mr. HOLMES said the material he referred to was not kokum butter, and the seeds from which it came were quite different.

Mr. WILLMOTT said he feared he should be compelled to overlook some of the remarks, whilst many of the criticisms which had been made would be found to be dealt with in portions of the paper which he omitted in reading. He had made no examination chemically of the different hydrocarbons, except such as were involved in the experiments he had narrated; but he thought there was very little difference between them chemically. Vaseline seemed to be prepared by a different process altogether; in fact, Messrs. Chesebrough's patent claimed a particular process which did not apply to the other hydrocarbons. That might account for the circumstance that in vaseline alone, and not appreciably in the others, the odour complained of became developed. It was claimed that vaseline was not a product of distillation, and thus possibly some of the benzoline oil remained in the preparation, and became developed in the course of time. A good deal had been said about wax, which was a subject well worthy of investigation, but he had not gone beyond the ordinary wax of commerce, which he had always found sufficiently good for the purpose intended. The wax mentioned by Mr. Williams was a special preparation, which he did not think was generally used in pharmacy. He was obliged to Mr. Moss for his experience with regard to vaseline. It was only after a long time in the case of vaseline itself, or after a shorter time when mixed with acetate or carbonate of lead, that the odour became developed; in the latter case he could state that with almost certainty the change would occur within six months. He had used different samples of vaseline, extending over a long time. He had not tested the stage of rancidity chemically, as time would not permit; but had simply judged by the physical properties of the ointment. Dr. Symes's suggestion with regard to glycerine was a valuable one, and he would bear it in mind. As far as he knew, white ozokerine, except in its freedom from colour, had no advantage over the yellow kind, and he did not know that Messrs. Field recommended it in preference. He presumed the colour was got rid of by filtration through animal charcoal. Mr. Conroy referred to peroxide of hydrogen producing rancidity; it was simply added to the milder nitrate of mercury ointment to prevent reduction of the mercury. The effect on the lard was no doubt prejudicial.

The new substance mentioned by Mr. Holmes was well worth consideration, and in all these cases it was very desirable that sufficient time should be given, and that those ingredients should be mixed with the bases which would test them in the severest manner, otherwise misleading conclusions might be arrived at.

The PRESIDENT said the Conference would no doubt appreciate the discussion which had taken place. There must be room for future research in connection with the material which separated when fats were filtered. He believed the following question would have to be reconsidered: What was the nature of and extent of the action of the material which separated from fats by filtration? He hoped this would be investigated.

The next paper was a—

NOTE ON THE PROCESSES OF THE BRITISH AND
UNITED STATES PHARMACOPŒIAS FOR THE
DETERMINATION OF HYDROCYANIC ACID.

By LOUIS SIEBOLD, F.I.C., F.C.S.

The members of this Conference will be aware that the two processes to which the title of this paper refers differ in two essential points. In the first place, the conversion of the acid into a cyanide is effected in the B.P. process by means of sodium hydrate, while the United States Pharmacopœia directs magnesia suspended in water to be used for the same purpose. The second and chief point of difference consists in the manner in which the decinormal solution of silver nitrate is applied. According to the B.P., this solution is to be added until a permanent precipitate of silver cyanide just begins to form, or in other words until the whole of the sodium cyanide has been converted into the soluble double salt Na Ag Cy_2 . The process of the United States Pharmacopœia does not stop at this point, but directs the addition of the silver nitrate solution to be continued until the soluble double cyanide (in this case $\text{Mg Ag}_2 \text{Cy}_4$) is again completely decomposed, or until the whole of the cyanogen present has been precipitated as silver cyanide. As this process is conducted in the presence of a small quantity of neutral potassium chromate, the end of the reaction is distinctly indicated by a red coloration due to the formation of silver chromate. A mere glance at the equations illustrating this process suffices to show that it requires exactly twice the volume

of silver nitrate solution as that of the British Pharmacopœia; but, strange to say, this fact seems to have been overlooked by the compilers of the United States Pharmacopœia. This serious error in its statement of the volume of silver solution required for a given weight of the acid to be tested has been already pointed out by Mr. R. A. Cripps, in a paper read before the School of Pharmacy Students' Association; and I can, therefore, at once pass on to the main object of this note, viz., the discussion of the question whether this process is in itself a good one, and whether or not it compares favourably with that of the British Pharmacopœia. Mr. Cripps, in the paper alluded to, speaks of it as less satisfactory, but gives no reason for his unfavourable opinion except the fact that the process requires a larger quantity of silver solution, but this feature seems to me an advantage rather than otherwise, for the larger the volume of a test solution required for the analysis of the same weight of substance, the greater must be the accuracy in the result, provided the method itself is free from inherent defects and is not inferior in the delicacy of its reactions. I have therefore tested this method for its accuracy, and can report to this meeting that, if properly conducted, it is thoroughly reliable, and certainly in nowise inferior to the process commonly used in this country. Indeed, in the hands of inexperienced manipulators, it appears to me the preferable one of the two. It does, however, require certain precautions, to which I desire to draw attention.

(1) Care must be taken that a sufficient amount of magnesia be used, for otherwise the results will be too low and entirely untrustworthy. The cause of the inaccuracy in this case is the same as that which renders the British official process fallacious in the presence of an insufficient amount of soda, as pointed out in my paper read before the Conference meeting at London (*Year-Book of Pharmacy*, 1874, p. 565). An excess of magnesia, however, is less injurious than an excess of soda in the other method, and does not appreciably affect the accuracy of the result.

(2) The magnesia used must be free from chlorides, and the hydrocyanic acid free from hydrochloric acid; otherwise the results will be too high. Both should, therefore, be tested for these impurities. It will be remembered that hydrochloric or other mineral acids are sometimes added to hydrocyanic acid with the idea of increasing the stability of the latter. The simplest mode of detecting such an admixture would be to boil some of the hydrocyanic acid for some time until this volatile acid is completely expelled, and then to test with silver nitrate.

If these precautions be duly observed, the results of the process are all that can be desired.

At the conclusion of the paper,

Mr. SIEBOLD added—In a paper on the estimation of hydrocyanic acid by Liebig's method, read at the Dublin meeting of the Conference, I pointed out that the same process might be advantageously employed for alkalimetric purposes, inasmuch as the volume of silver nitrate solution used in the titration indicates the proportion of alkaline cyanide present, but not a particle of any free hydrocyanic acid that may occur in the solution in consequence of the use of an insufficient amount of alkali. In the presence of such an excess of hydrocyanic acid, only the portion actually combined with alkali is indicated, and hence the proportion of alkali which has entered into combination with the acid may be as readily calculated from the volume of the silver solution required as that of the cyanogen. In the paper alluded to I explained the various advantages of this process over the usual methods of alkalimetry, and showed that alkaline carbonates can thus be accurately determined at an ordinary temperature with the same ease and precision as caustic alkalies. It is a noteworthy fact that, whereas hydrocyanic acid is incapable of decomposing alkaline carbonates, the decomposition is brought about in a most complete manner and without the aid of heat in the presence of silver nitrate, owing to the great tendency of hydrocyanic acid to form soluble and perfectly neutral double cyanides of silver and alkalies. While engaged in my recent experiments with the United States Pharmacopœia process for determining the strength of hydrocyanic acid, the use of magnesia in the place of soda, as directed in that process, suggested to me the probability that even the carbonates of the alkaline earths may be decomposed by hydrocyanic acid in the presence of nitrate of silver, and that this titration might perhaps also with advantage be extended to their determination. Experiments in this direction are now in progress, and the results will be communicated in due course.

The PRESIDENT said, considering the importance of hydrocyanic acid as a remedy, and its highly poisonous character, every contribution to existing knowledge respecting tests for this substance must be welcome, and the Conference would, therefore, appreciate Mr. Siebold's work in that direction. Mr. Cripps had stated that it was only his impression that the one process for estimating the

strength of hydrocyanic acid was preferable to the other, and that he intended to continue his work. He had no doubt he would do so, unless he saw that the matter was already in excellent hands. He was very glad to know that Mr. Siebold was carrying on his researches into these reactions in the direction he had indicated, and the result of those researches, whatever it might be, would be most welcome.

A vote of thanks was passed to the author.

Mr. JOHN WILLIAMS said he had for a great many years paid some attention to this question of hydrocyanic acid testing, and had always looked upon it that Liebig's test, at present recognised by the British Pharmacopœia, was a very great advance over any previous test, because neither hydrochloric acid or any other mineral acid interfered with it. He considered that the process now given in the American Pharmacopœia, in which magnesia was used, was a distinct retrogression, going back to the days before Liebig's genius had discovered the beautiful test which had been applied so successfully to hydrocyanic acid. The truth was that the hydrocyanic acid of commerce always did and must contain a preservative of some kind, and that preservative was generally hydrochloric acid. If prepared without that, it would change so rapidly and continuously that it would never be reliable after being kept for a very short time. The cause was easily explained: there was ammonia in the atmosphere and alkali in the glass of the bottle, and any alkaline condition whatever rapidly caused this change and the destruction of the hydrocyanic acid; therefore, the addition of a small quantity of a mineral acid ought not to be looked upon as in any way an adulteration, but simply as a preservative, and as such it was most valuable; but it was most important that there should be a test by which the hydrocyanic acid itself, and its strength, could be determined without reference to this mineral acid put in as a preservative. That was done in the present B. P. process, and would not be done by the new American test. Therefore, he entirely contended against the adoption of the American test in preference to that now used. It might be contended that hydrochloric acid ought not to be put into hydrocyanic acid; but that was another question altogether, and his experience was that it was necessary to add either that or glycerine, or some other substance, to act as a preservative.

Mr. DOTT thought it was unnecessary to boil off the hydrocyanic acid in order to test for hydrochloric, because cyanide of silver was soluble in nitric acid, whilst chloride was not.

Mr. NAYLOR had always felt extremely nervous in using Liebig's method for the determination of hydrocyanic acid, and for the last two or three years had entirely abandoned the method for the one suggested by Dr. Hannay. In that process mercuric chloride was used, the only objection to which was the instability of the volumetric solution of mercuric chloride.

Mr. SCHACHT said he had hoped to hear further explained the exact reason why Mr. Cripps found the United States Pharmacopœia process objectionable, and that the reason would have been the comparative difficulty of determining the moment at which the chromate of silver began to fall. His own experience he did not profess to be equal to that of the scientific chemists around him, but was merely that of a pharmacist who systematically endeavoured, before allowing his dispensing bottle to be filled with dilute hydrocyanic acid, to be quite sure it was of the proper strength, but so far as he had tried it he had been perfectly satisfied with the British Pharmacopœia process. The smallest particle of a drop of the nitrate of silver solution would certainly show the moment at which the operation must cease, and the most delicate determination of the strength of the solution was in that way easily arrived at. On the other hand, when he had attempted to estimate with chromate, he had found that that exact particle of a drop in the experiment he could not arrive at nearly so easily. The first deposit of chromate of silver he generally found required a little time. He would not say the process was not accurate, but it was certainly not so instantaneous. He had always to give a little repose to the solution before the first evidence of the chromate of silver appeared, so that in his hands the process never arrived at that beautiful delicacy which was obtained by the British Pharmacopœia process.

The PRESIDENT asked Mr. Schacht if he had found it necessary not only to render the mixture alkaline, but to maintain its alkalinity?

Mr. SCHACHT said he had observed that point most carefully since attention was directed to it by Mr. Siebold, who pointed out that it should be just in excess of the quantity which was ultimately found necessary to convert the whole hydrocyanic acid into alkaline cyanide.

Mr. TANNER said he could corroborate what Mr. Schacht had stated with regard to the difficulty of determining the end of the reaction when chromate of potassium was used. It appeared to him absolutely necessary that a considerable time should be allowed to satisfy oneself that the reaction was perfect; not so with regard to

Liebig's process. The determination there was sharp and decided, and there was no doubt left in the mind of the operator when the end of the process was arrived at. It was very necessary to take the precaution that the solution should remain alkaline, but it was also necessary that it should not contain too great an excess of alkali.

Mr. A. C. ABRAHAM said, some few years ago a paper appeared in the *Pharmaceutical Journal*, in which it was stated that the quantity of alkali was of great importance. Liquor sodæ was a cheap thing, and there was no fear of not using enough if they knew it was necessary; but if one got false results by using too much, it was of great importance. The next time, therefore, he had occasion to test this preparation, he made several experiments; he used 10 cubic centimetres of hydrochloric acid, 10 cubic centimetres of liquor sodæ, and got a certain result; then he used double and treble the quantity of liquor sodæ, and the results were practically absolutely identical, showing that there was no fear of getting false results by using anything like moderate excess. 10 c.c. were considerably more than was required, but that was the quantity he used to the best of his recollection. One objection to the Pharmacopœia process had not been alluded to, which was common to all the volumetric tests of the Pharmacopœia: the quantities used were directed to be taken by weight, and those quantities were inconvenient. It would be much more convenient if the direction was to take, say 10 c.c. of a liquid requiring so many c.c. of a volumetric solution, and would save an immense amount of trouble. He had calculated out the quantities in this way for the Pharmacopœia estimations, and found it amply repaid him for the trouble.

Mr. WHITLEY WILLIAMS said, in making titrations with a nitrate of silver solution in which chromate of potassium was used as the indicator, he had usually found that the degree of neutralization of the fluid mattered very little if the alkali present happened to be bicarbonate. The ordinary alkaline bicarbonate of soda or potash might be in any reasonable excess whatever—in fact, in excess far beyond what any one would think of using—without danger. He thought the use of magnesia in the American process was quite a chimerical advantage.

Dr. SYMES thought there was some little contradiction between the statement of Mr. Tanner that an excess of alkali was prejudicial to the result, and that just made by Mr. Abraham; but he thought Mr. Abraham must have started with a large excess, and having done so his results would probably correspond when he had a little

larger excess. If he had prepared it with the bare quantity necessary, and then with the soda in very large excess, he was inclined to think the results would be different.

Mr. A. C. ABRAHAM said he had used smaller quantities, but still the results were the same.

Mr. SIEBOLD said he perfectly agreed with Mr. Williams in everything he had said; and if that gentleman's remarks seemed to contradict some of the statements in his (Mr. Siebold's) paper, such contradiction was only an apparent and not a real one. He did not wish by anything he had said to replace the B.P. process by that of the United States Pharmacopœia; he had simply tested the relative accuracy of the two methods, and had arrived at the conclusion that if the precautions he had named were properly observed, the results of the U.S.P. process were at least as accurate and trustworthy as that of the British Pharmacopœia. It was certainly an advantage in the latter that the presence of chlorides did not interfere; but on the other hand, the larger volume of silver solution, and the use of magnesia in the place of soda, might fairly be considered as compensating advantages. How greatly the use of an insufficient proportion of soda impaired the result he had amply shown in a previous paper, as well as the extent of the inaccuracy brought about by an undue excess of alkali. Having the injurious effect due to both causes in his mind, Mr. Naylor said he had always used the B.P. process with a certain amount of nervousness; but he (Mr. Siebold) did not think there was any real cause for that, since mere testing with litmus paper at the end of the titration would at once settle the question whether or not an insufficient amount of alkali had been used, and as regards an excess of the latter, the inaccuracy of the result due to this cause was so trifling that, for all practical purposes, it might be ignored, unless the excess of the alkali used was unreasonably large. The use of magnesia, however, in the place of soda, as directed in the American process, would entirely remove this last-named source of error. Mr. Dott remarked that it was unnecessary to boil off the hydrocyanic acid in order to test this acid for hydrochloric acid, as the silver precipitates of the two acids behaved differently towards nitric acid. But as silver cyanide was only soluble in strong boiling and not at all in cold dilute nitric acid, he (Mr. Siebold) did not consider this difference as affording a satisfactory means of detecting hydrochloric in hydrocyanic acid. The difficulty of observing the first change from yellow to red which Mr. Schacht had experienced in titrations with silver nitrate where potassium chromate was used as an indicator, had never

given him any trouble; but he knew of others who had the same difficulty. This might be accounted for by the difference in the degree of sensibility towards slight colour changes in the eyes of different observers.

Mr. A. C. ABRAHAM asked whether cyanide and other impurities were not liable to be found in commercial soda, which might have produced the discrepancy some people noticed.

Mr. SIEBOLD said he had performed all his experiments with pure sodium hydrate, and did not know to what extent commercial caustic soda might be contaminated with cyanide, the presence of which would certainly impair the result.

A paper was then read entitled—

IODINE IN COD LIVER OIL.

BY EDWARD C. C. STANFORD, F.C.S.

"It is proposed to verify the statement in Garrod's 'Materia Medica' that cod liver oil contains 0·06 per cent of iodine." See "Blue List."

If this statement were true, cod liver oil would be one of the richest sources of iodine with which we are acquainted. At present the marine algæ form the only commercial European source of iodine. The largest quantity of iodine found in the deep sea tangle or stems of *Laminaria digitata* amounts in the fresh plants to about 0·1 per cent. The quantity obtained when this plant is burned into kelp seldom reaches 0·05 per cent. The average yield from laminaria drift on the large scale is 0·025 per cent.; but many thousands of tons of seaweed have been made into kelp and worked for iodine which have not yielded more than 0·005 per cent., and some even less than this; so that we have to deal on the large scale with a material, and constantly to test samples, containing very small percentages of iodine. I mention this in connection with the process daily employed for many years in estimating small amounts of iodine in our laboratory, and which has also been employed in obtaining the results from cod liver oil to be published in this paper.

Much difference of opinion has arisen amongst former observers with regard to iodine in cod liver oil and the statements of results are extremely conflicting, some chemists having failed to find iodine at all, others only in some specimens of this oil. Other chemists again have estimated the proportion of iodine as much higher than

the quantity above indicated; and it has been assumed that this element represents an important factor in its medicinal value.

In a well known work on *materia medica* the editors remark that the state of combination in cod liver oil "may, perhaps, tend to develop a peculiar action of iodine and bromine, and endow them with an efficacy not otherwise attainable."

The following results have been published at various times by the authorities quoted:—

	Iodine per cent.
Dorvault found in cod liver oil	0·150
Raie found in cod liver oil	0·180
Joseph found nearly $\frac{1}{2}$ per cent. . . .	0·487
Machenroden found	0·162 to 0·324
Grager found in light brown oil	0·0846
Dr. de Jongh found in pale oil	0·0374
" " pale brown	0·0406
" " brown	0·0295

All these are extremely high and improbable.

Mr. Mitchell Bird (*Pharm. Journ.* [2], i. p. 546) gives results of analyses of six varieties of cod liver oil, which are much nearer what I believe to be the truth. The method and the results differ considerably from mine, although we are both agreed in the fact that we have found iodine in all the specimens examined.

The percentage results are as follows, the iodine being calculated as potassium iodide:—

	As K I.	As Iodine.
1. Cod liver oil, Norway . .	·0021	} average. ·001755
2. Cod liver oil, Norway . .	·0018	
3. Cod liver oil, Norway . .	·0016	
4. Cod liver oil, Norway . .	·0016	
5. Cod liver oil, Newfoundland .	·0012	} average. ·000993
6. Cod liver oil, Newfoundland .	·0014	

He used 5000 grs. of the oil for each experiment and saponified with alcoholic solution of caustic potash, burned the soap formed, and dissolved out the salts; after saturating the solution with sulphuric acid and separating the potassium sulphate deposited, he employed the starch test, setting free the iodine with nitrite of potassium and sulphuric acid, and comparing the colour with standard solutions of potassium iodide. My method is different; it is a delicate process of very general application, and one that I adopted some years ago, having discarded all others in its favour. I will describe it here as applied to kelp, one of the most troublesome and various of all commercial substances to sample and test.

To insure an accurate sample about 100 lbs. are carefully picked from a cargo of say 100 tons, and ground up. Of this 100 grains are taken to estimate the moisture, and another 100 grains to estimate the soluble matter, the potash, and the iodine. The kelp is treated with about 4 ounces of hot water, which dissolves little or none of the oxysulphides: this operation is repeated, the residue washed and the solution made up to 5000 grains measure. Of this one-tenth part, or 500 grains measure, equal to 10 grains of kelp, is taken for estimating the iodine, so that we never operate on more than one-tenth of a grain of iodine, generally one-twentieth, often one-hundredth. In fact, if the amount present exceeds one-tenth of a grain, we always dilute the solution. One hundred grains measure of bisulphide of carbon are added, and a few drops (1 to 3) of nitrosulphuric acid * dropped in. The testings are performed in large even tubes, and compared with graduated standard solutions of potassium iodide treated in the same manner. By this method $\frac{1}{250000}$ th part is easily detected and measured, and up to $\frac{1}{100000}$ th part the estimation is very accurate. If the iodine in a seaweed or other organic substance is to be determined, it is carbonized in a small iron retort or crucible, and the charcoal treated in the same way. Burning to ash, however carefully done, involves a considerable loss of iodine, more than is generally supposed. For instance, a sample of seaweed ash exposed for twenty-four hours in an open crucible over an ordinary Bunsen burner will not retain a trace of iodine at the end of that time. We invariably carbonize the material in preference to burning to ash, in order to retain all the iodine and to easily extract the salts. Some of these specimens are extremely difficult, indeed, almost impossible, to burn to complete ash, on account of the large proportion of fusible salts present. In estimating the small quantities of iodine necessary in our analyses we are really limited to colour tests. I have long discarded starch, as it introduces an organic substance very liable to change, and in many circumstances unreliable. Moreover, in my hands it is not so sensitive as that with bisulphide of carbon. The solution is not perfectly transparent, and the indications not so sharp. The colour is spread over the whole liquid, and when dilute can only be seen by looking down the length of the tube, whereas in the bisulphide of carbon test it is removed out of the solution and concentrated in a sixth of the volume at the bottom of the tube. The comparison

* The nitrosulphuric acid is made by treating starch with nitric acid, and passing the nitrous fumes into sulphuric acid 1.843 sp. gr. to saturation. The mixture keeps very well.

of the two methods is very marked. In testing a solution of potassium iodide containing only $\frac{1}{250000}$ th part of iodine, the maximum effect is immediate, and another advantage is that the iodine can be easily separated from its solution in bisulphide of carbon. We usually recover the latter by treating it with zinc in the presence of water. The specimens of cod liver oil experimented on, for which I am indebted to our mutual friend and former President, Mr. Reynolds, were taken in quantities of 5000 grains each, saponified with 1000 grains of caustic soda, pure and free from iodine, then carbonized in a large porcelain crucible; the resulting charcoal was treated with hot water and made up to 5000 grains measure. One tenth of this, or 500 grains, was found quite sufficient to detect the presence of iodine and to estimate it. Three experiments were made, taking 500 grains, 2500, and 1000 grains respectively, with pretty concordant results. The mean results are appended.

In the first experiment the solution was tested at once in the manner indicated. In the second the solution was neutralized with hydrochloric acid in the presence of the carbon bisulphide, no iodine was eliminated until the nitrosulphuric acid was added. In the third the solution was neutralized with hydrochloric acid before the addition of the test solutions. Little difference was noticed. The following six specimens were selected :—

No. 1. Cod liver oil, pale.

No. 2. Cod liver oil, Norway.

No. 3. Cod liver oil, manufactured by Carr & Sons, Berwick-on-Tweed.

No. 4. Cod liver oil, English.

No. 5. Cod liver oil, Newfoundland.

No. 6. Light brown cod liver oil.

The mean proportions of iodine found were per cent.—

No. 1. 0.000410	} Mean percentage of iodine,
No. 2. 0.000434	
No. 3. 0.000276	
No. 4. 0.000138	
No. 5. 0.000315	
No. 6. 0.000360	
	0.000322.

I also estimated the iodine in fresh cod liver; the fishmonger informed me that it is not yet in season, but the result is here appended. Five thousand grains were treated in the same manner as the oil. Having stated on a former occasion (B. Pharm. Conference, Liverpool) that the oil vomited by the fulmar (*fulmaris*

glacialis)* of St. Kilda, and which, though obtained from a bird, has the reactions of a fish liver oil, contains iodine, I have also estimated this amount. Five thousand grains were treated in the same way as the cod liver oil.

Cod liver oil dragées are stated to be made of cod liver from which the oil has been removed; an analysis of these is also appended. One thousand grains, or 173 of the dragées, were employed saponified and with 200 grains of caustic soda. These are extremely rich in iodine, and would form a valuable source of that element if they can be procured cheap enough to contend with the present low prices. I notice, however, that a box of 250 dragées sells at 5s., and is considered (by the maker) to be equal to 6 pints of oil; so that the quantity employed would be equal to 83 ounces or 36,312 grains, or about seven times the quantity of oil used in the other experiments. It contains one hundred and eighty-seven times the proportion of iodine.

	Per cent.
Fulmar oil contains iodine . . .	0.000095
Cod liver, fresh, contains iodine . . .	0.000817
Cod liver oil dragées contain iodine . . .	0.056366†

It will be noticed that the fresh cod liver contains more than double as much iodine as the mean percentage in the oil. Mr. Gate has kindly sent me an estimate of the yield from his experience of ten years' average of oil from cod liver; it is about 45 per cent., taking the best time, December. The inference is that the liver without the oil would contain a much higher percentage of iodine, as shown indeed in the dry dragées. And I shall not be surprised to find as much in the fish. This point is under investigation.

Scotch herring has been said by "Jonas" to contain iodine, and this is also under investigation.

This morning I have received the results of the analysis of fresh cod, herring, and herring brine.

5000 grains of fresh cod were		
treated with	500 grains	caustic soda.
‡ 5000 grains of salt herrings		
were treated with	"	"
‡ 5000 grains of herring brine		
were treated with	"	"

* *Pharmaceutical Journal*, Nov. 1870.

† In the published analysis of these by Professor Garreau the iodine is estimated at 0.151 per cent., i.e., richer than any other known organic substance.

‡ Two determinations were made, one with 500 grains and another with 1500 grains, and the mean taken.

Fresh cod fish contained $\cdot 00016$ per cent. iodine dry = $\cdot 000829$.

Scotch herring, salted, contained $\cdot 00065$ per cent. iodine.

„ brine „ $\cdot 00012$ „ „

The cod fish contained $80\cdot 7$ per cent. water.

In the fresh cod fish the analyst for the first time in these experiments was troubled with a large quantity of sulphides, and in this case only was not satisfied with the indication from 500 grains measure, and was obliged to use the larger quantity.

It will be seen that the herring contains four times the amount of iodine contained in the cod fish, and more than in any of the samples of cod liver oil; if therefore the iodine be the medicinal element, you should recommend Scotch herring salted; it is very cheap at present.

I find the subject becoming interesting and, indeed, alarming to the iodine maker, and intend examining other varieties of fresh fish, for I expect to find iodine in all; and if so, every man who eats fish will become his own iodine eliminator. Specimens of true, genuine, unmixed whale, seal, and bottle-nose oil have been sent me by my friend, Captain John Gray, a celebrated Peterhead whaler, to whom the arctic regions are a kind of "Winter Garden," and these are under examination, but I cannot yet report the results.

Since the publication of the paper, the following results have been obtained, the respective oils having been treated in the same manner as the cod liver oil:—

	Per cent.
Whale oil, cold drawn, contains iodine .	$\cdot 00001$
Bottle-nose „ „ .	$\cdot 00010$
Seal „ „ .	$\cdot 00005$

The PRESIDENT, in proposing a vote of thanks to Mr. Stanford, said it was very satisfactory that so great an authority on iodine should have attacked this subject, and handled it so thoroughly.

The vote of thanks was passed unanimously.

Mr. EKIN did not think the experiments Mr. Stanford referred to were necessarily antagonistic to the results of his experience with regard to the delicacy of the starch test, the conditions being so distinctly modified that they would more than account for any difference in result. It would be remembered that his experiments were directed to the detection of very minute quantities of nitrites in potable water, and the reverse conditions under which Mr.

Stanford searched for iodine were very different. He (Mr. Ekin) found time an important element in the delicacy of the test.

Mr. STANFORD said he had no doubt that testing for nitrites with iodide of starch was an extremely delicate indication, but that was not so with the solutions he had to do with, the solutions for cod-liver oil being not unlike those ordinarily dealt with. No doubt in iodide of starch it was necessary to give some time, whereas in his experiments the results were immediate—in fact, they were rather tied up to immediate results.

A paper was next read on—

THE TREES YIELDING BENZOIN.

By E. M. HOLMES, F.L.S.

The benzoïn which enters into English commerce includes four varieties, named respectively Sumatra, Palembang, Penang, and Siam benzoïn. These exhibit certain characteristic appearances by which they are easily recognised, and three of them, namely, Sumatra, Penang, and Siam benzoïn, are probably derived from three distinct plants. The botanical source of Sumatra benzoïn was determined by Dryander, and an account and figure of the plant were published by him in the *Philosophical Transactions* for the year 1787, lxxvii., p. 303, but the trees which yield the other varieties have as yet never been identified with certainty. The Penang benzoïn is similar in appearance to the Sumatra kind, but it has an odour which is quite distinct and resembles that of storax. It is in all probability not produced by *Styrax benzoïn*; but we have as yet no accurate information concerning the botanical source of Penang benzoïn. The authors of "Pharmacographia" point out that it may perhaps be the produce of *Styrax subdenticulata*, Miq., since this tree, which occurs in West Sumatra, has the same name, "Kajoe Kéminjan," as *S. benzoïn*, and Miquel remarks of it *an etiam benzoiferum*? That these two species should receive the same native name in Sumatra is not surprising, since the leaves are very similar in shape and appearance, and the fruit of *S. subdenticulata* apparently only differs from that of *S. benzoïn* in being obovate instead of globular and depressed.

Palembang benzoïn resembles the Sumatra sort in odour, and differs from it chiefly in its much greater transparency and in yielding, as I am informed, a larger percentage of benzoic acid. It frequently contains moisture, and if recently imported specimens

are placed in a bottle they soon become mouldy. Concerning the tree which yields Siam benzoin, nothing definite has hitherto been ascertained, although as long ago as 1859, Mr. D. Hanbury wrote to Sir R. H. Schomburgh, asking him to investigate the origin of the resin, and to find out whether the tree which yielded it was really *Styrax benzoin*. Nor have subsequent inquiries been more successful. The only account extant of the mode of collection of Siam benzoin is that given by Sir R. H. Schomburgh, who was British consul for some years at Bangkok. He, however, never visited the region producing benzoin, and could therefore only give information at secondhand. He represents that the bark is gashed all over, and the resin which exudes collects and hardens between it and the wood, the former of which is then stripped off. The authors of "Pharmacographia" remark that it is evident that all Siam benzoin is not thus obtained. Schomburgh adds that the resin is much injured and broken during its conveyance in small baskets on bullocks' heads to the navigable parts of the Menam River, whence it is brought down to Bangkok.

The state of our knowledge of Siam benzoin being thus imperfect, it occurred to me to write to Mr. R. Jamie, of Singapore, to ask him for information on the subject. This gentleman takes great interest in all that relates to pharmacy, and has, I believe, been a liberal contributor to the museum of the North British Branch. A few weeks ago I received from him a box of specimens for the museum of the Pharmaceutical Society, containing amongst other interesting and valuable donations some sections of the trunk of the Siam benzoin tree, and herbarium specimens of the leaves, but unfortunately neither flowers nor fruit; also specimens of the Sumatra benzoin tree, with leaves, flowers, and fruit. In addition to these specimens he has contributed some interesting information, which I have taken this early opportunity of laying before you. With regard to the Siam benzoin plants, Mr. Jamie writes:—

"My friend, Captain Hicks, of Bangkok, kindly procured them, after very great difficulty, from his friend living in the district where the gum benzoin trees are found, and he writes as follows:—
'According to your request I had fifteen gum benjamin plants brought over from Suang Rabang, one of the northern Laos states tributary to the King of Siam, but after a deal of shifting and removing baggage on bullocks, twelve of them withered up; however, I have succeeded in getting three of them brought to Chung-mai; these I now send you. The one in the flower pot seems to be thriving remarkably well, but the other two in bamboo joints

I have my doubts about. I also send you some sections of wood with the bark attached, and here and there you will find the gum sticking on the wounds and incisions made by the natives. The flowers, I am sorry to say, I could not get, as the trees have already flowered. From reliable information the tree is indigenous in all the northern Laos states, but grows luxuriantly in Suang Rabang all along the belt of mountains in this province.'

"In the months of April and May the leaves begin to wither and fall off, and the natives then make incisions in the bark, and after a short time a lot of milky substance exudes and soon hardens; the gum then dries on the incisions and falls to the ground, which is swept daily and watched, so that no earthy matter gets mixed up with it.

"The tree attains from three to six feet in circumference, and has a long trunk throwing out branches on the top; after six years' growth it can be bled. The flowers are attached to the small branches close to the leaves and begin to flower in June. The tree throws out shoots from the roots, and can be propagated by cuttings. The natives also say that after the flowers fall off, in a short time a lot of young plants spring up.* The gum is a considerable article of traffic, in fact a monopoly, fetching a good price in the Bangkok market. It is used generally for fumigating sick rooms and making scented water. Large quantities generally find their way to Bangkok, being brought overland on oxen to Sawaryaloke, Pitchai, and other Siamese provinces, and are exported to Europe by several mercantile firms."

Of the three young plants above mentioned, one was given by Mr. Jamie to the curator of the Singapore Botanical Gardens to forward to Kew, a second was planted in Mr. Jamie's own garden, and the third died.

The twig which I now exhibit was taken by Mr. Jamie from the young plant in his garden. The specimen sent to Kew is still living, and seemed to be in a healthy state when I saw it a fortnight since. Judging from the appearance of the plant at Kew and from the leaves sent by Mr. Jamie, the Siamese benzoin tree is probably a distinct species, although nearly allied to *S. benzoin*, Dry. The leaves are rather thinner, the lateral veins are fewer in number and the veinlets more prominent beneath, but it is necessary to wait until flowers and fruit are obtained before the exact species to which it belongs can be ascertained. Mr. Jamie has now the

* This evidently means that the seeds quickly germinate, as is the case with those of the Sumatra benzoin tree.

two growing together in his garden, and remarks in his letter, "Judging from what I have seen of the two kinds growing together, they are different."

I have compared the specimens of the *Styrax benzoin* tree from Mr. Jamie's garden with Dryander's original specimen in the British Museum, and they correspond exactly.

Concerning this tree Mr. Jamie writes: "The Singapore grown tree is thought to be from Palembang; * it is about 30 feet in height, and the branches are all at the top. The circumference of the trunk is from 14 to 16 inches. It flowers in March, and the fruit does not take long to mature, then it falls off, producing seedlings in abundance at the foot of the tree. How old this tree may be is rather difficult to determine, but it must be over thirty years at the least."

The tolerable certainty that in a short time flowers and fruit of the Siam benzoin tree will be obtainable, and that the source of the drug can then be definitely set at rest, must be my excuse for bringing incomplete information before you. I need none for bringing the admirable specimens presented by Mr. Jamie under your notice.

The PRESIDENT, in moving a vote of thanks to Mr. Holmes, said the Conference ought also to thank Mr. Jamie for the specimens which had enabled Mr. Holmes to contribute his paper.

The PRESIDENT drew attention to a curious specimen of adulteration of beeswax, in which a coating of good wax had been apparently cast round a core of inferior quality.

The Conference then adjourned for luncheon. On resuming, the following two papers were read—

SESAME OIL: REPORT ON ITS SUITABILITY FOR PHARMACEUTICAL PURPOSES.

BY MICHAEL CONROY, F.C.S.

This is one of the subjects suggested by the Executive Committee of the Conference for investigation, and a reference is given in the "Blue List" to Flückiger and Hanbury's "Pharmacographia," wherein we find it stated that "good sesame oil might be employed without disadvantage for all purposes for which olive oil is used";

* If so, then it supports my supposition that Palembang and Sumatra benzoin are produced by the same tree.

and a footnote in the same work further states that "for pharmaceutical uses, the larger proportion of olein and consequent lesser tendency to solidify should be remembered." These recommendations, coupled with the fact that it is one of the least alterable of the fixed oils, being much superior to olive in this respect, seemed to me to entitle the subject to further consideration, and the trouble of a few experiments with the view of solving the question.

The chief point to be observed in experimental work is to ascertain that the article operated upon is genuine; and with this in view the sesame oil used in these experiments was obtained from a reliable source, and it was further carefully examined by the usual tests for impurities. It was a pale, yellowish-coloured oil of sp. gr. .921, possessing a bland, sweet, nut-like taste, with neutral reaction. Concentrated sulphuric acid converted it into a deep brownish red jelly. The addition of 2 per cent. of a cooled mixture, in equal parts, of strong nitric and sulphuric acids caused it to acquire a deep green colour, rapidly changing into deep brown; and to other well-known tests it answered equally satisfactorily.

The principal use of olive oil in pharmacy is in the preparation of plasters, liniments, and ointments, and to test the suitability of sesame oil for these, the following experiments were put in hand, and samples of the results are on the table.

1. A small batch of lead plaster was prepared by the usual process, using sesame instead of olive oil. Combination took place as with olive oil, and occupied about the same length of time, but towards the end the plaster considerably darkened in colour, although steam was reduced and ample water present. The plaster, however, became fairly white by "pulling," but all attempts to make and retain it in the form of rolls were futile; and although the sample before you was made more than a month ago, it is still quite soft, and is not likely ever to set firmly. In respect to adhesiveness it is quite equal to that prepared with olive oil.

2. Liniment of ammonia was next tried, the result being a combination quite equal to that prepared with olive oil, and though a little thinner in consistency, it did not show any separation after standing several days.

3. Liniment of lime. Specimens were made with sesame and olive oil, both with the same lime water, freshly prepared, and of full strength; the result being, with sesame oil, a liniment much thinner than the one prepared with olive oil, and which separated considerably on standing, while that made with olive oil kept well.

4. With the official ointments into the composition of which

olive oil enters, excepting ointment of nitrate of mercury, no difference was observed in the substitution of sesame oil. In the case of the nitrate of mercury ointment, however, the result was an unsightly orange-coloured preparation that in a few days became still more unsightly by working up in the jar and further darkening in colour.

It is therefore very evident that this oil cannot replace olive for the chief pharmaceutical uses, since plaster made with it will not set sufficiently to be portable, either in the form of rolls or when spread for use; neither can it satisfactorily be used for lime liniment, because of its tendency to separate. These defects are undoubtedly due to the large amount of olein contained in this oil, and consequently lesser proportion of the more solid glycerides; and it is very singular that these defects are what chiefly recommended the oil to the authors of the "Pharmacographia," namely, the "larger proportion of olein and consequent lesser tendency to solidify."

Where, however, no chemical combination takes place, and where simply a bland sweet oil, possessing good keeping properties is required as an ointment basis, perhaps no better could be chosen; and on this account I consider it much more suitable as a substitute for almond oil in the preparation of ointments. Samples of the principal ones contained in the British Pharmacopœia have been prepared, and are on the table, which, to my mind, are quite equal in every respect to those prepared with almond oil.

SESAME OIL: ITS SUITABILITY FOR PHARMACEUTICAL PURPOSES.

By THOMAS MABEN, PHARMACEUTICAL CHEMIST.

The literature relating to sesame oil is very meagre, and in "Pharmacographia" alone do we find anything like a satisfactory description of the article and its uses. The learned authors of that work state that the oil "might be employed without disadvantage for all the purposes for which olive oil is used," and it is with the view of indicating the reliability or otherwise of this opinion, that I have, acting on the suggestion contained in the "Blue List," undertaken the preparation of this report.

Sesame oil differs little in its physical characters from either olive or almond oils. It has not the tinge of green which all but the finest specimens of the former possess, and is of a rather more decided shade of yellow than the latter, but generally speaking the

difference in colour is not very marked. The odour of a fine specimen of sesame oil is very slight, while the taste is at first sweetish and bland with a peculiar after-flavour. Olive oil becomes grainy through the deposit of a crystalline fatty body at 5° C., but the olein does not solidify till about -5° C. Sesame oil congeals at -5° C., and almond oil is liquid till -20° C. is reached. The difference in the congealing points is doubtless due to the percentage of olein, of which almond oil "consists almost wholly" ("Pharmacographia"); sesame oil contains 76 per cent. (*ibid.*), and olive oil 72 per cent. (Braconnot). According to the best authorities, however, the percentage of olein varies according to circumstances; and, in like manner, different samples of the same oil differ in density, as is evident from the fact that hardly two authors agree in giving the same specific gravity for any one oil. The following table shows at a glance the relative specific gravities:—

	"Pharmacographia."	A. H. Allen.	Other Authorities.	The Author.
Sesame Oil . . .	·919 (23° C.) . .	·923 to ·924	·932 . . .	·923
Almond Oil . . .	·920	·916 to ·920	·917 to ·920	·919
Olive Oil	·916 (17.5° C.) .	·914 to ·917	·910 to ·917	·918

From these figures it will be seen that olive oil is the least dense, while sesame oil is the heaviest; "Pharmacographia" gives a very low specific gravity for sesame oil, but this may probably be accounted for by the difference in the temperatures at which the observations were taken, and by the fact that the oil made use of by Flückiger was extracted with ether, whereas the sesame oil of commerce is obtained by expression. Taking into consideration the physical properties generally of the three oils, it seems on *à priori* grounds quite probable that sesame oil would make a good substitute for either olive or almond oil, and I have in this investigation taken account of most of the galenical preparations in which these are employed.

Let me remark in passing that this similarity in appearance has led, according to some authorities, to the extensive use of sesame oil as an adulterant of almond oil, and probably also of olive oil. This sophistication may be detected in the case of almond oil by the application of a test mentioned in "Pharmacographia." "The oil shaken with (a mixture of equal weights of) sulphuric and nitric acids takes a fine green hue, as shown in 1852 by Behrens, who at the same time pointed out that no other oil exhibits this reaction."

This coloration may be made use of in testing almond oil for sesame with perfect success, provided we bear in mind a fact not mentioned by Flückiger; *viz.*, that the green rapidly changes to a red-brown. Pure olive oil takes on, with the same reagent, a shade of green, which might easily be mistaken for the green produced by a mixture of almond with 5 or 10 per cent. of sesame, were it not that the former is permanent, while the latter almost immediately passes into the red-brown referred to. In the case of suspected olive oil, this reaction may be supplemented by Mr. Conroy's nitric acid test. Nitric acid when heated with seed oils till the action ceases produces a distinct red colour. When heated with olive oil, its only effect is (apparently) to change the oleic acid to elaidic acid, which solidifies on cooling. This is a valuable test, giving indications even with very small percentages of foreign seed oil, but unfortunately different shades of colour are produced by different oils; and unless we are certain of the presence of a particular adulteration, the colour is almost sure to mislead, though probably not to a very great extent. As this report has reference more to the use of sesame oil for pharmaceutical purposes than to its abuse as an adulterant, it is unnecessary to go further into the question of tests.

The two classes of preparations in which oils are chiefly used are the plasters and the ointments. In preparing these it must be remembered that there is a larger percentage of olein in sesame than in olive oil, and the proportions of the different ingredients must be regulated accordingly, otherwise the particular plaster or ointment will be too soft.

Plasters.—*Emplastrum plumbi* being the basis of nearly all the plasters, it may be taken as the type of this class of preparation. Lead plaster is essentially a soap, and is prepared by heating together plumbic oxide and oil in the presence of water, the result being that the glycerine separates, while the fatty acids combine with the metal to form the oleo-margarate of lead. This plaster can be successfully prepared with sesame oil, the only modification in the process being the allowance of a larger quantity of oxide of lead, as just referred to. Prepared with olive oil, lead plaster is nearly white, very friable, and only slightly adhesive; prepared with sesame oil, it is darker in colour, much less friable, and much more adhesive. Of itself the former cannot be used for adhesive plaster, the requisite "stickiness" being obtained by mixing with it a small quantity of resin and also a little soap. This forms *Emplastrum resine*, and when spread on calico is the sticking-plaster of the shops. Though very adhesive, this is somewhat irritating on in-

flamed surfaces, and liable, in homely phraseology, to "canker" a wound, and if sesame lead plaster were used alone, or with a smaller proportion of resin, it would in my opinion prove an excellent substitute.

Most of the plasters of which *Emp. plumbi* is the basis are, like itself, apt to become brittle when kept for a time. Belladonna and other plasters, which are frequently kept ready spread, crack disagreeably, and are not so adhesive as when recently prepared. The use of sesame oil for these also is an advantage.

Ointments.—Sesame oil is perfectly applicable for most of the British Pharmacopœia ointments, whether it takes the place of olive or almond oil. Spermaceti, resin, and simple ointments are as elegant alike as regards colour, odour, or consistency as any prepared according to the Pharmacopœia, and, so far as I have been able to judge, quite as durable.

Some ointments are apt to change and become unfit for use, such as those of acetate of lead, iodide of cadmium, oxide and iodide of mercury, etc.; and it is hardly probable that the use of sesame oil will arrest the usual course in their case, but after the lapse of several months I find each of them quite sweet and good.

An ointment somewhat difficult to prepare and also to keep is *Ungt. hydrargyri nitratis*. Seed oils do not usually make a good preparation, owing to the presence of some peculiar reducing agent, which tends to decompose the mercury salts in the ointment. This decomposition is accomplished much more rapidly by some oils than by others, rape oil for example acting quickly, while sesame oil acts somewhat slowly. The action also goes on more energetically at a high than at a low temperature. In the case of rape oil, ointment prepared at 80° C. will keep good for a few days, perhaps even a month, but sooner or later it will inevitably go wrong. If, however, the temperature at time of preparation be raised to 100° C., decomposition takes place at once. On the other hand, ointment prepared with sesame oil at 100° C. keeps good for several months, but ultimately it becomes decomposed; while if the initial temperature be 150° C., decomposition will be immediate. I am at a loss to account for the reaction which takes place. From what we know of the action of nitric acid on seed oils, we would naturally expect the ointment to be red. It is, however, of a greenish hue, so that probably the nitric acid is made use of in another direction. Whatever be the cause of the reaction, it is evident that sesame oil is quite unsuitable for the preparation of this particular ointment.

On a general review, we may conclude that in the case of plasters

a superior preparation may in some instances be obtained by the use of sesame oil in place of olive oil; and that there is no reason why it might not be employed as a substitute for both olive and almond oil in the preparation of the B.P. ointments, with the single exception of *Ungt. hydrargyri nitratis*.

The PRESIDENT, in proposing a vote of thanks to Mr. Conroy and Mr. Maben, said those two gentlemen did not come to quite the same conclusion, but probably Mr. Conroy's objection would be met by Mr. Maben's suggestion to use more base where chemical reactions took place, as in certain of the liniments and plasters. They also differed slightly in the specific gravity of the oils, but no doubt different samples would differ in that respect.

A vote of thanks to the authors was passed.

Mr. WILLMOTT said he gathered from what had been read that the sesame oil, although preferable in some instances, was not recommended as being generally superior to olive oil, whilst in some cases it was evidently inferior. He would simply suggest that in those cases where it had been considered equal or superior to olive oil some further time should elapse before any conclusion was arrived at.

Mr. TANNER said he had worked somewhat in the same direction, and could fully confirm what Mr. Conroy said as to sesame oil in the preparation of *emplastrum plumbi*. It made the plaster too soft if made in the proportions given in the Pharmacopœia. That objection seemed to have been met by Mr. Maben by using a larger proportion of lead oxide, but his experience was that there were other objections. The lead plaster made with sesame oil, not only had an entirely different odour, but the odour was very disagreeable, and when the plaster was spread rancidity took place in a few days. So rapid was this action that he had known large quantities of this plaster when spread become so heated in twenty-four to forty-eight hours that it was considered dangerous to pack it. With reference to *Ungt. hyd. nit.*, Mr. Conroy appeared to have an ointment which became first an orange and then an objectionable brown colour. He had found that it turned orange at first, and in a few days changed to red, and remained that colour for three or four months. Sesame oil, therefore, was not calculated to take the place of olive oil in the most valuable of pharmacopœial preparations. In *linimentum ammoniac* it certainly seemed preferable.

Mr. CONROY said he had tried the experiment of adding a further

amount of base, but still found the plaster soft, and he could not see how the use of a larger percentage of base would make the difference. With regard to the specific gravity, the one he had given was from the sample on the table, which he had every reason to believe was perfectly genuine. He did not think that a further length of time was necessary in testing this oil as compared with olive oil, because that also became rancid. The difference of odour mentioned by Mr. Tanner would not be much objection, because he did not think people cared about that in a plaster. The rancidity he mentioned was very likely due to the softer nature of the plaster. He was surprised at the colour obtained by Mr. Tanner, which was probably due to some other seed oil being present.

A note was then read on—

THE STATE OF COMBINATION IN WHICH MORPHIA EXISTS IN OPIUM.

By D. B. DOTT, F.R.S.E.

Who it was that first discovered (or guessed) that opium contains morphia sulphate I have not been able to ascertain, the published references to the matter being few and not very informative. At a former meeting of this Conference (1879), Professor Flückiger gave it as his opinion that morphia is "present in opium as a sulphate, at least for the most part." This conclusion was arrived at from the observation that an alcoholic solution of opium contains sulphuric acid, which cannot exist as inorganic sulphate, and must therefore be present as alkaloidal salt. In the discussion which followed the reading of the professor's paper, Mr. Naylor appears to have upheld the view that the morphia exists partly as meconate and partly as sulphate; but the report of his remarks is obscure and ambiguous. The latter opinion I believe to be correct, though not for the reasons given by Mr. Naylor, who appears to found principally on the alleged fact that crystals of meconate and sulphate are formed in solutions of opium. Although I have obtained crystals of morphia sulphate from an opium extract, I never yet observed in it crystals of meconate.

The facts which render it almost certain that morphia exists in opium both as sulphate and meconate are briefly as follows:—

1. An aqueous extract of opium contains sulphuric acid in sufficient quantity to combine with the whole of the morphia.

2. The same extract contains meconic acid in quantity insufficient to convert all the morphia into meconate.

3. The extract contains inorganic and organic bases, with which the sulphuric acid will unite in preference to the morphia; and the remainder of the sulphuric acid will not suffice to combine with all the morphia.

Seeing then that the sulphuric acid, which is free to combine with the morphia is insufficient to unite with the whole of the alkaloid, it is evident that part of the morphia must exist as meconate. From the acid nature of opium solutions, and on account of the great difficulty (if not impossibility) of obtaining crystalline meconate from them, I formerly concluded, and still consider it probable, that the morphia meconate present in opium is the *acid* salt. This, however, is not absolutely certain, as the meconic acid may be partly combined with narcotine, papaverine, etc., while the colouring and extractive matters might prevent the neutral meconate from crystallizing. The subject is one by no means free from difficulty, and would require very many experiments to thoroughly clear it up. I have discussed the matter more fully in a paper read last session before the Royal Society of Edinburgh.

The PRESIDENT said the Conference was very grateful to Mr. Dott for this paper; but after what the author, an authority on such matters, had said respecting the difficulty surrounding the question as to the condition in which morphia existed in opium, they could not expect much discussion.

A vote of thanks was passed to the author.

The next paper read was on—

SWEET SPIRIT OF NITRE.

BY ALFRED CLAY ABRAHAM, F.C.S.

Although the term sweet spirit of nitre does not occur in the British Pharmacopœia, and consequently that name cannot strictly be applied to the preparation now official, the latter was undoubtedly intended as a substitute for the older preparation, and I shall apply the term indifferently to both. I need not enter into the history of this preparation, which will be found in Christison's "Dispensatory," and more recently in a comprehensive article by Warrington in the *Pharmaceutical Journal* [2], vol. vii., p. 7.

It will suffice to remind you that until 1826 the process adopted

had been almost, if not quite, universally that of distilling together a mixture of nitric acid and spirit of wine. The strength and proportions of these ingredients differed from time to time very considerably, but neglecting secondary reactions (however important they may have been), we may, I think, consider that the necessary result would be the production of tolerably constant proportions of nitrite of ethyl and aldehyde. No doubt some of the more violent formulæ, *i.e.*, those in which strong nitric acid, or that acid in large proportion, was used, would cause the oxidation to be carried much further. As to the probability of this, I may refer to Mr. Alsop's experiments, which will be found recorded in the *Pharmaceutical Journal* [2], vol. iii., p. 425. This gentleman found that by dropping the spirit gradually into the acid scarcely anything but acetic ether was formed. This would seem to show that it was by no means only the aldehyde which suffered decomposition. I should perhaps here say that what I am endeavouring to show is that the preparation so long known under the name of sweet spirit of nitre, and which obtained and maintained a certain reputation, was essentially an impure solution of nitrous ether and aldehyde, containing approximately an equal number of molecules of each of these compounds.

In the Dublin Pharmacopœia of 1826 a formula was given for the preparation of nitrous ether, in which the nitric acid was formed during the distillation by the action of sulphuric acid upon nitrate of soda.

In 1839 the Edinburgh Pharmacopœia gave directions for the preparation of nitrous ether from strong nitric acid of 1.500 sp. gr. and subsequent purification first with milk of lime and afterwards by shaking with a concentrated solution of chloride of calcium, and separating the ethereal liquid which rose to the surface. The London Pharmacopœia, however, never departed from the old process.

In the first British Pharmacopœia of 1864 an entirely new process was adopted, which consisted in distilling together nitrite of soda, sulphuric acid, and spirit of wine.

The main objection to this plan was the difficulty and expense of preparing a satisfactory nitrite of soda, which when prepared, as directed, seldom, I believe, contained more than about 20 per cent. of the nitrite. Shortly before the publication of our present Pharmacopœia in 1867, Professor Redwood read a paper upon "Spirit of Nitrous Ether," a report of which will be found in the *Pharmaceutical Journal* [2], vol. viii., p. 508. Professor Redwood's experi-

ments showed, what I believe has never since been denied, that when nitric acid and spirit are distilled together, no nitrous ether to speak of is formed until the proportion of spirit has been reduced to about four times that of the acid, at which point the reaction becomes violent, and of course produces a number of secondary products, to none of which can the normal action of the preparation be imputed. The condemnation of the old nitric acid process was based upon these grounds.

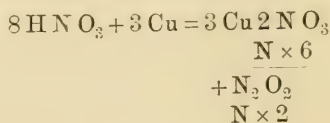
The Dublin and Edinburgh processes he condemned for three reasons; viz., (1) The difficulty of carrying them out on the large scale; (2) the excessive cost; and (3) The alteration in character of the product. The nitrite of soda process was condemned on the grounds I have before named, and a number of other processes now forgotten were rejected for reasons which he states. Amongst the latter was the process of forming the nitric acid in the presence of the spirit by the use of a nitrate and sulphuric acid.

This was stated to be open to the same objection as the Edinburgh and Dublin processes, but in what way this was so Professor Redwood did not state.

Professor Redwood then described a new process, which was shortly afterwards adopted in the British Pharmacopœia and which is too well known to all to need any description. If I had been as well aware a few years since as I am now of what had been done by well known chemists in attempting to improve this preparation, I should have been discouraged from making any further experiments and you would probably have been spared the infliction of this paper. I was not, however, aware of what had been done, and was therefore induced to consider why the pharmacopœial product so soon spoiled or at least deteriorated, and why the old-fashioned preparation still remained so largely in favour and had the reputation of keeping so much better.

I mention the questions which arose in my mind, not because I have been able to solve them, but because they drove me to the conclusion that there must be something formed when following the official formula which had a destructive action upon the other ingredients. I was the more induced to favour what we may call the direct nitric acid method from a conviction that the explanation of the pharmacopœial process generally received was erroneous, and to impute the moderate action and constant temperature peculiar to that process rather to the action of the sulphuric acid upon nitrate of copper, or to the increase of the boiling point by the admixture of sulphuric acid, than to the formation of nitrous acid.

My first experiment (*a*) was the following, and was made to test the accuracy of my supposition that the production of nitrous ether was based upon the action of sulphuric acid upon nitrate of copper. 3 ounces of copper and 9 fluid ounces of nitric acid were caused to react, the result being, of course, a waste of one-fourth of the acid, which reduced the available quantity to $6\frac{3}{4}$ fluid ounces, *i.e.*, 50 per cent. more than ordered in the British Pharmacopœia.



Sulphuric acid, 3 fluid ounces, spirit rect., $1\frac{1}{2}$ pint, were then mixed, added to the nitrate of copper previously formed and distilled.

The reaction proceeded with great regularity, and the fluid ounce product was 4 pounds 9 ounces = $96\frac{1}{2}$; *i.e.*, 4 fluid ounces more than the British Pharmacopœia directs to be produced.

From this 3-4 per cent. separated when the Pharmacopœia test with solution of chloride of calcium was applied. This promised well, but as a green insoluble powder, which I took for basic nitrate of copper, remained in the retort, I was induced to try using a smaller quantity of the acid. 3 ounces of copper, 6 fluid ounces of nitric acid, were combined, the product containing the nitric radical equal to $4\frac{1}{2}$ fluid ounces of nitric acid, *i.e.*, the B.P. quantity, was treated as before. Product $87\frac{1}{2}$ fluid ounces, which separated nothing with solutions of chloride of calcium. This certainly would not do, and as No. 1 had only one advantage over the Pharmacopœia *viz.*, the greater regularity of its distillation, and on the other hand required the use of much more copper, and twice as much nitric acid, I looked out for some base which would fulfil the following requirements; *viz.*,—

1. Be cheap.
2. Constant in composition.
3. Easily decomposed at the required temperature by the sulphuric acid.
4. Exist either in the state of nitrate in commerce, or in that of some compound which could be converted into a nitrate without loss of nitric acid.

Calcium seemed to answer these requirements best, but I was afraid that it might liberate its nitric acid too rapidly.

The following was tried :—

{ Acid. nitric., $4\frac{1}{2}$ fluid ounces } combined.
 { Calc. carb. præcip., $3\frac{1}{2}$ ounces }
 { Acid. sulph., 3 fluid ounces } mixed.
 { Sp. rect., $1\frac{1}{2}$ pint }
 Sp. rect., 3 pints. In receiver.

The carbonate of calcium was placed in a flask of about a gallon capacity—although this is much larger than necessary; the nitric acid was poured gradually upon it and the flask then set aside for the contents to cool. I believe that in my first experiment the nitrate of calcium was left for several days, but this is quite immaterial.

The sulphuric acid was mixed with a pint and a half of the spirit, poured upon the nitrate and distilled into the remaining three pints of spirit.

The distillation proceeded with great regularity from the beginning to the end; the product was $86\frac{1}{2}$ fluid ounces of a liquid of specific gravity $\cdot 8453$ at $60\frac{1}{2}^{\circ}$ F., and separated 3–4 per cent. by the chloride of calcium test.

This product appeared in every way equal to that made by the Pharmacopœia process, and as the quantity drawn over, viz., $86\frac{1}{2}$ fluid ounces, was 4 fluid ounces or nearly 5 per cent. greater than that authority directs to be recovered, the result could not be considered unpromising. I should say that the first $82\frac{1}{2}$ fluid ounces were tested and found only to separate about 1 per cent., but the remaining 4 fluid ounces of product raised it to the strength I have named. This latter fact and some other indications which I had during the distillation showed that the quantity of spirit added with the sulphuric acid was too great, and I therefore modified the form thus:—

{ Acid nitric., $4\frac{1}{2}$ fluid ounces } combined.
 { Calc. carb. præcip., $3\frac{1}{2}$ ounces }
 { Acid. sulph., 3 fluid ounces } mixed.
 { Sp. rect., 1 pint }
 Sp. rect., $3\frac{1}{2}$ pints. In receiver.

In this case the nitrate of calcium was used the day after it was made, but in other respects the same details as before were followed:—

Product, 4 pounds 10 ounces = $87\frac{1}{2}$ fluid ounces.
 Specific gravity, $\cdot 8463$.
 Separated, 3–4 per cent.

The distillation occupied less than one hour. I liked this process much better than the Pharmacopœia one; but it had one

drawback, which I imagined might be fatal to it as a manufacturing process on a large scale. The sulphate of calcium remaining in the retort forms a magma, from which in quantity I imagined it likely that some difficulty might be experienced in distilling even as much as the Pharmacopœia directs to be drawn over, without applying such a heat as would perhaps injure the product or partially dehydrate the sulphate of calcium, and consequently water the product.*

To avoid this possible difficulty, I fell back upon my supposition that possibly the sulphuric acid might so raise the boiling-point of the mixture of nitric acid and spirit as to reach the temperature necessary for the formation of the nitrite of ethyl.

The proportions of nitric acid, sulphuric acid, and spirit ordered by the Pharmacopœia were therefore mixed and distilled into the remaining spirit. The product, perhaps through some neglect, was not satisfactory.

I suspect, however, that a continuous process, in which the supply of spirit and nitric acid should be adjusted so as to maintain a regular and proper temperature would work well, although unsuited to a Pharmacopœia, which must when possible give a process adapted as well to the small as to the large maker.

Since making these experiments, I see that the United States Pharmacopœia has adopted such a process as I myself tried (form e), but I have not tested its capabilities.

I have tried some other formulæ for the manufacture of this preparation, but their results do not justify me in occupying your time by recounting them.

And now, gentlemen, having mentioned such experiments as seemed to me of interest, I will, with your permission, repeat what I said before; viz.,—That the preparation which gained a certain reputation under the name of *spiritus nitrici dulcis* was one produced by the direct action of nitric acid upon spirit of wine.

Nitrite of ethyl was long ago found to be a constituent of this, and it was assumed, on very slender grounds, I believe, that to it alone was due the medicinal activity of the preparation.

Rimmington says (*Pharm. Journ.* [3], viii., 341) that nitrous ether when free from aldehyde and other oxidized products will keep well in well-stoppered and full bottles for four to six months; but as samples *d* and B.P. (see table) have been kept seven months

* Since writing, Mr. Michael Conroy has relieved my mind upon this point by very carefully preparing a large batch in Messrs. Evans, Sons & Co.'s laboratory. I have to express my obligation both to him and to them.

in bottles *not full*, exposed to bright light in a warm room, and moreover have had a number of small samples taken from them, as would be the case in dispensing, it would seem as if the aldehyde did not exert a very deleterious action. Mr. Rimmington also points out how valuable the nitrous acid formed in the stomach from the nitrite of ethyl may be in febrile diseases; but he forgets that acetates are *known* to do what he only suggests as a function of the nitrous acid, and so fails to appreciate the value of the aldehyde, which we may fairly assume will be converted into acetic acid and afterwards into an acetate *when it reaches the blood*, where its action is required.

I believe we have as much right to say that aldehyde is the active ingredient as to credit nitrite of ethyl with being such. Holding these views, I have made no attempt to prepare a pure solution of nitrite of ethyl in spirit, and have indeed practically returned to the old process, so modified, however, as to eliminate the sources of loss and the impurities due to a very violent reaction. The British Pharmacopœia process has been supposed to produce less aldehyde than the old process, and proportionately, no doubt, this is true, because I suppose there is no doubt that most of the nitrous ether was formerly lost.

That this supposition with reference to the aldehyde is not correct, however, when the Pharmacopœia product is compared with the product of form *d*, is, I think, roughly shown by adding to both a sufficient quantity of caustic potash. The colour produced is almost exactly the same. I would venture to suggest that formula *d* is a better one than the pharmacopœial, for the following reasons:—

1. The product is 5 per cent. greater.
2. The cost is less.
3. The process is more analogous to the old one.
4. Occupies much less time.
5. The distillation is much more regular.
6. The proportion to be distilled is one-third less. Advantages 4, 5, and 6 recommend it as a manufacturing process.

There are other points which may be noted in its favour, although we have no direct means of estimating their value.

When the impure nitrous ether produced by the Pharmacopœia process is mixed with the spirit and shaken, an evolution of gas always takes place, which will blow out the stopper unless it is removed.

The process which I recommend does not produce this result.

The residue in the retort when operating by the Pharmacopœia process has a very nauseous smell, forcing one to believe that some very complicated secondary reactions have been going on.

The residue of process *d* is perfectly sweet.

Of course these virtues would count for nothing if the product did not equal that produced by the present official process. That it does, however, I have satisfied myself and hope to be able to satisfy others, although my analytical investigations have by no means been carried out to the extent to which I should have wished, or, indeed, as far as they would have been had business permitted.

All tests have been comparative; that is to say, they have been applied to the products of form *d* and the British Pharmacopœia, made on the same day with the same apparatus and ingredients. No satisfactory test for nitrous ether, when mixed with spirit, aldehyde, etc., has yet been devised. As far as I am aware, those of Dupré and Muter, which will be found in the *Analyst*, vol. iv., p. 121, must, I think, estimate aldehyde, which could hardly escape oxidation, at least to some extent, during the processes employed.

I have therefore simply titrated, when fresh and practically neutral, with liq. sodæ, and satisfied myself that the quantities required by both were practically the same.

The taste of the two preparations is indistinguishable, and when fresh they are equally neutral.

The sp. gr. of product from form *d* is certainly slightly lower; but this, if not merely due to the recovery of the 5 per cent. more spirit, could easily be rectified by using a dried nitrate of calcium.

With regard to the keeping properties of the respective preparations, I must refer you to the table; but with regard to the amount of acidity; I must admit a doubt as to whether the pharmacopœial product does not liberate less free acid when kept than the product of form *d*. Bicarbonate of potash did certainly seem to cause more effervescence with the latter than with the former. Thinking that this might be due to the more rapid decomposition of the nitrite of ethyl, I applied the following test, which, however, seems to me to be a more promising one for the general quality of the preparation than of any value for the purpose for which I originally applied it.

To an ounce of water I added a crystal of neutral iodide of potassium, 100 fluid grains of the sample, and estimated the liberated iodine with volumetric solution of hyposulphite of soda.

The results, which I think are interesting, are tabulated, and fairly show, I believe, the natural loss due to time. One thing at

	Product. fl. oz.	Sp. gr.	Separated per cent. when fresh.	Separated when three months old.	Separated when seven months old.	Liberated from KI when fresh.	Liberated when seven months old.
a.	Cu 3 oz., HNO ₃ 3 fl. oz. combined. H ₂ SO ₄ 4 fl. oz., sp. rect. 1½ pint mixed. Sp. rect. in receiver, 3 pints.	·845	3-4				
b.	Cu 3 oz., HNO ₃ 6 fl. oz. combined. H ₂ SO ₄ 3 fl. oz., sp. rect. 1½ pint mixed. Sp. rect. in receiver, 3 pints.	not taken.	nothing.				
c.	Cu Mt. 4½ fl. oz., Ca Co ₃ 3½ oz. combined. H ₂ SO ₄ 3 fl. oz., sp. rect. 1½ pint mixed. Sp. rect. in receiver, 3 pints.	·8453	3-4				
d.	HNO ₃ 4½ fl. oz., Ca Co ₃ 3½ oz. combined. H ₂ SO ₄ 3 fl. oz., sp. rect. 2½ pints mixed. Sp. rect. in receiver, 3½ pints.	·8463. at 57°	3-4.	3	2	104	100
e.	HNO ₃ 4½ fl. oz., H ₂ SO ₄ fl. oz. } mixed. Sp. rect. 1½ pint. Sp. rect. in receiver, 3 pints.	not taken.	nothing.				
P.B.	HNO ₃ 4½ fl. oz., H ₂ SO ₄ fl. oz. } mixed. Sp. rect. 1½ pint. Sp. rect. in receiver, 3 pints.	·8456 at 57°	3-4	3	2	106	101

The above samples were all made by using a glass flask, heated on a steam funnel, as described and figured in the *Pharmaceutical Journal* of May, 1882.

least seems perfectly clear; viz., that the success of the P.B. process is not due to the formation of nitrous acid, but to the increased boiling point resulting from the presence of the sulphuric acid, which is gradually eliminated as the distillation proceeds by its action upon the copper, or upon nitrate of copper, and thus maintains a proper equilibrium.

The above test being dependent equally upon the nitrite of ethyl and the aldehyde, or the acetic acid formed from it, would seem a very suitable one for a preparation in which both have an equal claim to recognition.

And now, gentlemen, having, I fear, exhausted your patience, I have only to apologise for bringing before you a subject which to properly treat would require more time than I have been able to give to it, and I hope you will regard the formula which I have recommended, not as a perfected one, but merely as one sufficiently successful to justify further experiments.

In connection with this subject, I may be permitted to describe an arrangement which I have devised to overcome what to me was always a great difficulty, due to the utter repugnance which fresh spirit of nitrous ether has for being inclosed in a tube, and mixed with chloride of calcium solution.

This piece of barometer tube is or ought to be divided into three portions, each holding 50 fluid grains, and the lower one again divided into hundredths. The peculiarity consists merely in substituting for a stopper or cork a short piece of strong rubber tubing, which can be compressed by means of a strong screw pinch-cock.

This allows of a certain amount of expansion and obviates all difficulty.

I need hardly, in a paper of this nature, refer to the most unsatisfactory nature of the Pharmacopœia tests, tests which if regarded as applicable to a preparation not new would condemn the most conscientious pharmacist in the country to an invidious police charge. Some latitude must be allowed or chemists will be obliged in self-defence to make the preparation originally considerably above the strength indicated.

The PRESIDENT moved a vote of thanks to Mr. Abraham. He said a vast deal might be said on this subject, but he hoped members would condense any remarks they had to make, bearing in mind that at present no one quite knew what it was they spoke of when

referring to sweet spirit of nitre. He did not know that any one could say that the original sweet spirit of nitre was a solution of nitrite of ethyl at all, or that it was a solution of aldehyde. It was quite certain none of the processes which had been proposed yielded a perfectly definite article. For anything they knew, the substance might owe its activity mainly to nitrous ether, to aldehyde, to other things, or to a combination of all. These matters had never been sufficiently investigated by therapeutists. He had thrown out a hint once or twice that it would be extremely desirable if some gentleman well acquainted with therapeutics would say what was the action, so far as he could ascertain it, of a solution in spirit of nitrous ether, and of a solution in spirit of aldehyde, and that might induce pharmacists to produce an article which should have definite composition. With regard to the tests, there was none on which reliance could be placed which would give them information they did not at present possess. They could demonstrate the presence of nitrite of something in sweet spirit of nitre, and the presence of aldehyde; but he feared up to the present time there was no method of quantitatively estimating satisfactorily either the amount of aldehyde, of nitrous ether, or of any other substance. He hoped that a knowledge of this preparation would be extended sooner or later, and there was some hope it would be so, because a useful pamphlet had been published on the subject by Professor Eykman, of Tokio, an abstract of which had appeared in *New Remedies* of May, 1882, and the *Pharmaceutical Journal* of July 22nd, 1882, in which the author gave a method of estimating the nitrous ether, or whatever else it might be called. That method depended on eliminating nitric oxide gas, and estimating its volume; it did not take any account of either nitrous or nitric acid present, but it was to be assumed that any one experimenting would ascertain the absence of these substances. It was possible it might yield trustworthy indications as to the amount of nitrite of ethyl in the article experimented on, and he recommended it to those investigating this subject in order that they might arrive at some reliable data.

Mr. WILLIAMS thought it hopeless, as he had often said, to produce anything like absolute or uniform results by mixing together in a retort certain ingredients, and distilling something out of that retort. He would say no more on that matter, because all the researches of pharmacists tended to prove the same thing. He had attempted to make a sweet spirit of nitre synthetically. He had made a 10 per cent. solution of pure nitrite of ethyl condensed in

absolute alcohol, and the result was not, as far as flavour was concerned, sweet spirits of nitre. He had then made a 10 per cent. solution of pure aldehyde in alcohol, and the result was certainly not sweet spirits of nitre. Mixing the two together in equal proportions the result had no resemblance whatever to sweet spirits of nitre, and no one would accept it as the sweet spirits of nitre the public required. Chemically speaking, therefore, sweet spirits of nitre must be something different from what it was often assumed to be, a mixture in equal parts of nitrite of ethyl and aldehyde. The aldehyde was very objectionable, so offensive indeed that if present in any large proportion it would spoil the flavour of any sweet nitre if it contained anything like the proportion of 5 per cent. He had had lately to do with the body recently introduced to medical notice, called paraldehyde, in which three molecules of aldehyde were polymerized into one of the new body. This new body was believed to be a very potent and powerful medicinal agent. They did not know much about its real activity at present, but it promised to be a very important drug and chemical agent of the future; but it was remarkable that the flavour of this particular modification of aldehyde was so similar to that of sweet spirits of nitre that he believed it was to a great extent the real ingredient combined with nitrite of ethyl, for which they had been seeking. Pure aldehyde when brought in contact with a very small quantity of hydrochloric or sulphuric, or almost any acid, was converted, not by any combination taking place between the acid and the aldehyde, but by an internal re-arrangement of molecules and condensation, so that three molecules of the aldehyde were condensed into one molecule of the new body. This change might be seen going forward in the flask in which the operation was conducted, in the most beautiful manner. The aldehyde, which was so volatile that it could hardly be condensed, and so disagreeable that its vapour could hardly be breathed, and insoluble in water, and with a flavour that could not be tasted without offence, became a mild-tasting body, boiling at 120° C., changed in all its nature, except probably in its medicinal activity, and perfectly soluble in water—or solution of chloride of calcium. He believed this body was produced naturally by the ordinary process adopted in making sweet spirits of nitre, especially when the operation was conducted slowly. In carefully working with pure aldehyde, he found it could not be entirely converted into paraldehyde in one operation; about one third of the aldehyde was converted partly into acetic ether, and partly acetone, and these two bodies had been distinctly separated

in a pure state. He could answer for it, however, that a very small quantity of free acid was capable of converting a large portion of the aldehyde into paraldehyde, acetic ether, and acetone, while the nitrite of ethyl, which would also be produced, as part of the reaction of the Pharmacopœia process for making sweet spirit of nitre, would go to make up the complex body which they knew as sweet spirit of nitre.

Dr. SYMES said the remarks of Mr. Williams were very suggestive; but if paraldehyde was the active ingredient in spirits of nitrous ether, it could not be *sweet* spirit of nitre, because, as far as he could judge, paraldehyde when considerably diluted was anything but *sweet*. He wished to remark that there was a practical matter which affected them all; and that was that whilst their knowledge was so uncertain about sweet spirit of nitre, it did seem a great hardship to pharmacists that, on the authority of an uncertain test, gentlemen were frequently prosecuted and fined for not being able to produce a body which it was pretty clearly shown could never be produced with certainty twice alike.

The PRESIDENT remarked that the case to which he believed Dr. Symes referred was decided on analytical evidence, depending, not on the pharmacopœial tests, but on the permanganate test, quite a recently proposed method.

Dr. SYMES said the point was that this body was not constant to any known test.

Mr. MOSS said he did not know what the state of the law on sweet spirit of nitre in the United States was, but if he remembered rightly, in the report of the committee of revision of the U.S. Pharmacopœia, it was recommended that some such process as that of the B. P. should be employed; that copper, sulphuric acid, and nitric acid should be distilled together in a retort, and something obtained from them; the something, whatever it was, was then to be mixed with a saturated solution of chloride of calcium in order to separate this same substance which was obtained in testing spirits of nitre by the pharmacopœial test. It would look as if in America they devised their process rather with a view of standing this test than from any notion they might have as to what sweet spirit of nitre really was.

Mr. NAYLOR said he would not enter into the question of the manufacture or composition of sweet spirit of nitre, but he did think it very desirable that in the coming Pharmacopœia the method suggested by Dr. Dupré for the estimation of the nitrite radical should be adopted. There was certainly a make of spirit of nitre

obtainable, which, when examined by that method, would at any rate correspond to 3 per cent. of crude nitrous ether. In the new U.S. Pharmacopœia the manufacturing method with copper was abandoned.

Mr. WHITLEY WILLIAMS said he believed that in sweet spirit of nitre there was a considerable proportion of things which gave nitrous acid, which were not in any sense of the term nitrites. Sweet spirit of nitre probably contained a considerable quantity of nitroso-aldehyde compounds.

Mr. DOTT remarked that with regard to the physiological action of this drug, Professor Matthew Hay, of Aberdeen, confirmed his own opinion that the diuretic action of sweet spirit of nitre was due to the nitrous radical in the compound; his experience with other nitrites agreed with that.

Mr. A. C. ABRAHAM had listened with great pleasure to Mr. Williams' remarks, and was not surprised that the solution of nitrous ether was not like sweet spirit of nitre; he did not think any one would expect that it would be. With regard to paraldehyde, he was extremely pleased to hear what Mr. Williams said. He had, indeed, only a few days since expressed to Mr. Conroy his suspicion that possibly paraldehyde was one of the active principles of sweet spirit of nitre. His attention had only recently been called to this body, and his suspicion was not founded upon such a basis as Mr. Williams had mentioned; still, whether paraldehyde or aldehyde, it was the same group of molecules, whether in the treble or single state. After all, the action of sp. æther. nit. was not supposed to be so much sedative—while that of paraldehyde was—as diuretic, and he doubted whether, supposing paraldehyde was present, the value of the preparation might not be judged by the amount of nitrous acid liberated in following out the test he had suggested. The framers of the United States Pharmacopœia were to his mind considerably too radical; they had had a glycerine period, and now they had one which might have some other feature equally objectionable in it. In matters of this kind they should be cautious, and stick to the old processes as much as possible; they knew that the direct action of nitrous acid on spirit produced a preparation which was wanted, which had a certain efficacy, and he thought they should give a certain preference to that. He hoped that he had shown that it produced as much nitrous ether and aldehyde as the Pharmacopœia process, but it could easily be increased in strength in that direction if desired.

A paper was then read on—

AN EXAMINATION OF SOME SAMPLES OF PITCH AND ASPHALT.

Br E. DAVIES, F.I.C., F.C.S.

Having had a sample of American asphalt sent to me, suspected of being stearine pitch, I found that very little information could be found in books with reference to either pitch or asphalt. I have, therefore, collected samples of all kinds of pitch or asphalt which I could obtain, and although I have been unable to meet with some kinds occasionally imported, as Cuban and Mexican, I trust that the notes which I have made will be found to have some value. No attempt has been made to analyse the organic matters in these varied products. They are no doubt mixtures of great complexity and, so far as manufactured pitch is concerned, of variable composition, according to the heat used in their manufacture. As my object was mainly the identification of the various commercial articles, I have only determined the ash, the sulphur, and the amount soluble in petroleum spirit, sp. gr. 700. The last of these determinations does not admit of very great precision. In almost all the samples there is a substance highly fluorescent, and very slightly soluble in petroleum spirit, to completely remove which was impracticable without such prolonged treatment as was inconvenient. I therefore performed the extraction as follows:—50 grains of the sample, if possible in fine powder, was allowed to stand an hour with 1 ounce of petroleum spirit, and frequently agitated. It was then boiled for a short time, the solution decanted, and the residue boiled with 10 successive half ounces of petroleum spirit. All the solutions were filtered through a weighed filter, upon which the residue was finally washed and dried at 100° C.

The sulphur was determined by fusing with nitrate of potassium and carbonate of sodium, except in those cases in which the substance would not powder. These were treated with a large excess of pure fuming nitric acid, first at a gentle heat, and afterwards boiled, the solution largely diluted with water, almost neutralized with ammonia, filtered, and precipitated with chloride of barium. The sulphur was determined in the part insoluble in petroleum spirit, in one of the Syrian asphalt, and in the ash of Trinidad pitch and Val de Travers asphalt.

The samples examined were three of coal-tar pitch, by three large makers. They vary in the amount soluble in petroleum spirit,

owing, no doubt, to the extent to which the distillation was carried. These have a conchoidal fracture, and give a black powder.

Rosin Pitch.—Obtained in the distillation for rosin oils. This has a conchoidal fracture, but gives a brown powder, and is almost entirely soluble.

Stockholm Pitch.—This is a black mass, too soft to powder, and is very soluble.

Stearine Pitch.—A black mass, which will powder with difficulty, not so soluble as the two previous kinds.

Trinidad Pitch.—This is the natural product of the celebrated pitch lake of Trinidad. It is a brown, earthy-looking substance, giving a brown powder. About two-fifths of the organic matter is soluble, and the ash is almost entirely silicious.

Fine Syrian Asphalt.—A natural product, almost black, but giving a dark brown powder.

Low Syrian Asphalt closely resembles the "fine," but contains more earthy matters. These, with the Trinidad pitch, are remarkable for the high percentage of sulphur. The presence of sulphur in natural asphalt has been noticed before. The *Journal of the Chemical Society*, 1879, p. 896, contains an abstract of a paper by O. Helm, in which it is stated that Syrian asphalt contains 9·13 per cent. of sulphur, and a sample of American asphalt 10·85 per cent. The sulphur was almost entirely in combination with the organic matter. These figures are higher than those which I find, but no doubt there are variations. The sulphur was found to be in the fine Syrian 6·13 per cent., of which 3·74 per cent. was in the portion insoluble in petroleum spirit, and 2·39 per cent. in that soluble. The ash of the Trinidad pitch contains ·137 per cent. of sulphur.

American Asphalt.—This is evidently a manufactured article, and not a natural product. It is a black, brittle substance with a conchoidal fracture, and gives a black powder. It is soluble to the extent of about two-thirds in petroleum spirit, and is quite different from stearine pitch, both in its appearance, brittleness, and in the percentage of sulphur. I cannot learn the origin of it, but it is shipped from San Francisco.

Vul de Travers Asphalt.—This is a limestone, rather magnesian, soaked in a soft bituminous substance, entirely soluble in petroleum spirit. The limestone contains ·15 per cent. of sulphur as sulphate of calcium. The organic matter, therefore, contains only 2·74 per cent. of sulphur. I regret that my application for a sample of Seyssel asphalt was not successful.

Burgundy Pitch.—An examination of the only pitch recognised in the Pharmacopœia was necessary, if only to give this paper a better title to your consideration, but it is a substance of a totally different nature from the others treated of in this communication. It is a resin of a yellow colour, and, although easily pulverized, soon becomes a solid mass at the ordinary temperature of the air.

The accompanying table gives the results of the investigation for comparison :—

Description.	Soluble in Petroleum Spirit.	Insoluble.	Ash.	Sulphur.	Organic matter soluble in P.S.	Organic insoluble in P.S.	Sulphur in organic matter
Coal tar pitch, No. 1	24·44	75·56	·20	·69	24·49	75·51	·69
" " No. 2	18·70	81·80	1·06	·41	18·90	81·10	·41
" " No. 3	15·86	84·14	·48	·59	15·94	84·06	·59
Rosin pitch . . .	86·94	13·06	·58	·26	87·45	12·55	·26
Stockholm pitch . .	91·46	8·54	·84	·015	92·23	7·77	·015
Stearine pitch. . .	71·05	28·95	5·50	·04	75·18	24·82	·04
Trinidad pitch . . .	36·24	63·76	37·76	3·47	58·22	41·78	5·35
Fine Syrian . . .	48·16	51·84	·68	6·13	48·49	51·51	6·17
Low Syrian . . .	49·68	50·32	2·64	5·65	51·02	48·98	5·80
American, No. 1 . .	65·64	34·36	·60	·62	66·03	33·97	·62
" No. 2 . . .	63·62	36·38	·26	·85	63·78	36·22	·85
Val de Travers . . .	9·76	90·24	90·24	·41	100·00	none.	2·74
Burgundy pitch . .	99·04	·96	·14	none.	99·18	·82	none.

I have to acknowledge the valuable assistance rendered by Mr. Arthur Haddock in making many of the analyses.

The PRESIDENT, in proposing a vote of thanks to Mr. Davies, said some of the samples mentioned contained nearly 100 per cent. of organic and combustible matter. Some alarm had been created by the public press within the last six months respecting the relation of asphalt to fire, and it had been suggested that the laying of asphalt, so called, in the streets, and as a roofing for houses, or rather as the external coating of other roofing, was well calculated to set fire to the whole of a city. He feared possibly some support to this notion might be derived from Mr. Davies's research, because there could be no doubt that some of the asphalts to which he had alluded were very combustible. It was, therefore, important to bear in mind that what was known by the public as asphalt, and was used for paving and roofing purposes, was a substance containing something under 10 per cent. of true asphalt, and over 90 per cent. of absolutely incombustible matter, and that in fact it was

practically impossible to set light to what was popularly known as asphalt, so that it might of itself continue in a state of combustion. Of course a little reflection by any one who knew the composition of this so-called asphalt would show that there was not the most remote danger connected with its use. No doubt asphalt pure and simple was combustible, and so was gunpowder combustible; but if the latter was mixed with 90 per cent. of sand or other mineral matter, it would be exceedingly difficult to set fire to that mixture, and it would be still more difficult to set alight the mixture of asphalt and mineral matter which was commonly used for paving and roofing.

A vote of thanks was passed.

Mr. THOMAS HUGH WILLIAMS said some of the remarks which Mr. John Williams had made with regard to white wax, and which might with equal justice have been made with regard to sesame oil, might also be applied to Burgundy pitch. The compound met with in commerce under that name had very little right to be called Burgundy pitch, but was simply a mixture of resin, palm oil, and water, and the figures which had been put forward seemed to him very suggestive of such a mixture.

Mr. CONROY said chemists and druggists would not buy genuine Burgundy pitch, and, as a rule, would only have the fictitious article, which was of a much brighter colour than the genuine; he did not think the public would have it either.

Mr. HOLMES said one chemist that he knew had told him he always used Burgundy pitch, but obtained it with difficulty, and his customers preferred it, because it was not so irritating, but had a more beneficial effect. Some years ago, having succeeded in obtaining a small quantity, he took from time to time all he could get of it, having tried in vain to get it from any other wholesale house.

The next paper was a—

CONTRIBUTION TO THE PHARMACY OF THE POMEGRANATE.

By LOUIS SIEBOLD, F.I.C., F.C.S.

The great value of the root-bark of *Punica granatum* as a remedy for tapeworm is so well established as to need no comment. It is well known, however, that the administration of this drug often results in failure on account of the extremely nauseous astringent taste of its decoction, and its consequent rejection by the stomach,

a fact which renders it almost useless for ladies and children. The usual way of meeting similar objections in other cases, by substituting the active principles for the crude drug, does not seem to promise well in this instance, owing to the difficulties attending the isolation of these principles in a pure state, and their proneness to decomposition (see C. Tanret's researches on pelletierine and the other alkaloids of the pomegranate, abstracted in the *Year-book of Pharmacy*, 1878, p. 43; 1879, p. 38; and 1880, p. 64.) The question then arises, whether it is possible to produce, by a comparatively simple process, a pharmaceutical preparation of this bark, which, while possessing the full activity of the drug, is at the same time free from the nauseous taste and the unpleasant effects alluded to. Such a preparation I believe I have succeeded in making. I do not wish to trouble the meeting with the various steps taken in working out the problem, nor with particulars of unsuccessful experiments in the direction indicated, but will at once lay before you the details of the process finally adopted.

Six ounces of the coarsely powdered root-bark are digested three successive times with 48 fluid ounces of water at 160° F., previously acidified with a few drops of acetic acid, each time for about twelve hours, during which the mixture should be frequently agitated and the temperature maintained at or near the point given. The strained infusions, measuring in all nearly 140 fluid ounces, are united, and gradually mixed with solution of sugar of lead until no further precipitate is formed on testing filtered portions; the whole is then filtered, the slight excess of lead removed from the filtrate by a current of washed sulphuretted hydrogen, the mixture warmed for some time to expel the excess of the gas, and again filtered, and the perfectly clear liquor evaporated on a water-bath to the consistence of a syrup, at a temperature not exceeding 140° F. Evaporation *in vacuo* would probably be better still; but this I have not tried. Finally, the small quantity of residue left is mixed with syrup of orange peel sufficient to produce a draught of about 2 fluid ounces. This draught represents a dose for an adult, and should be taken at once, first thing in the morning, the patient abstaining from food and keeping quiet for about four hours after the administration. A diet of meat and fish, without bread or farinaceous food of any kind, should be observed for the two days preceding the cure, and on the last day no food whatever should be taken after dinner. During this afternoon it is also advisable to clear the bowels by means of a mild purgative; if then the draught be taken at about two or three o'clock the following morning, and sleep again resorted to after its

administration, the patient will have done all he can to ensure success.

In eight out of nine cases in which the efficacy of this preparation was tested, the entire tapeworm was expelled within five hours after the consumption of the draught, and in one case only success was not complete. The eight cases comprise three of *Tenia solium*, and five of *T. mediocannellata*. In one of the latter instances not the slightest care as regards diet was observed, and, contrary to all instructions, the patient took a heavy supper the night before the administration of the draught, and yet the entire worm was expelled. In all the eight cases various tapeworm remedies had been tried previously, decoction of pomegranate root-bark being also among those employed without success, the head of the worm remaining, although the decoction in the cases alluded to was retained by the patient. It would thus appear that the preparation I have described, in addition to being free from all objectionable taste, may also be superior to the decoction of the bark in point of activity, owing, probably, to the entire absence of astringent principles, the abundant presence of which in the decoction is not unlikely to counteract the effect of the anthelmintic constituents.

The preparation obtained as above has a pleasant fruity flavour and is readily borne by the stomach. The most fastidious patient would take it without the slightest difficulty. The value of such a preparation appears to me the greater from the fact that all tapeworm remedies of repute share the nauseous taste and sickening effects of the decoction of pomegranate bark.

While admitting that the cases in which this new preparation has thus far been put to the test are yet not great in number, I think I am justified by the results in inviting the best attention of medical practitioners on the one hand, and of pharmacists on the other, to this subject. Those who are fully acquainted with the numerous failures in the treatment of cases of tapeworm by even the most renowned remedies, must long since have felt the want of a preparation combining efficacy with freedom from all unpleasant taste.

The PRESIDENT proposed a vote of thanks to Mr. Siebold for this admirable contribution to practical pharmacy. The value of the dose would seem to quite justify the pharmaceutical labour and care necessary for its preparation. It appeared that 6 ounces of material had to be treated with 7 pints of water, then concentrated into a very small quantity and made up to 2 fluid ounces for a dose. He did

not see any objection to that, in fact it seemed an opportunity for pharmacists to develop their power ; but still he should like to know whether the preparation kept well, or whether it must be prepared whenever it might be wanted.

Dr. QUINLAN, having been accustomed to encounter the difficulty of expelling tapeworm, wished to bear testimony to the great value of this paper. There was no more troublesome affection to deal with, and up to the present time the remedy principally relied upon was turpentine, which was disagreeable, and occasionally dangerous, because if not at once eliminated from the system it might produce serious results. The pomegranate bark was an old Spanish remedy, which had rather fallen into disuse, and he was glad to see it revived, and to hear of this method for its preparation. He should immediately try it, and report the result to the medical journals.

Mr. TANNER asked if he understood Mr. Siebold rightly, that the extremely nauseous taste of pomegranate preparations was due to an organic acid.

Mr. SIEBOLD said it was due to tannic and gallic acids.

Mr. TANNER also asked whether the removal of the surplus lead, which was effected by sulphuretted hydrogen, could not be sufficiently effected by some other means, either dilute sulphuric acid or soluble carbonate, because the appliances for using the sulphuretted hydrogen process might not be found in all pharmacies.

Dr. SYMES said if it were not verging too much on the medical aspect of the question, he should like to ask Mr. Siebold whether the oil of male fern had been tried in the cases to which he referred. Dr. Quinlan had said the only remedy at their disposal was turpentine, but in his experience oil of male fern was very frequently employed.

Dr. QUINLAN said he meant to say that the principal remedy on which physicians could rely was turpentine ; they frequently used male fern and other remedies, but turpentine was always sure, and constantly in cases where they had tried other things they had to go back to turpentine.

Mr. SIEBOLD said he was much obliged for the kind offer of Dr. Quinlan, and should eagerly look forward to the result of his trials. As regards the time the preparation would keep, he had noticed no deterioration in the course of two months, but he had no experience as to how much longer it could be kept without injury. In the case he had mentioned all the usual tapeworm remedies had been unsuccessfully tried, oil of male fern among the number. He could not recommend the use of sulphuric acid in the place of sulphuretted

hydrogen, for the removal of the lead, as any excess of this acid would, during the subsequent evaporation, injuriously affect the activity of the preparation, for this he had found in the course of his experiments to be the result of long continued heating in the presence of mineral acids. He was quite aware that the directions he had given were rather too tedious to allow of the preparation being made from a physician's prescription in the ordinary course of business; but he should like to see a wholesale house of repute undertake to produce the preparation on a large scale for the supply of dispensing establishments.

The next paper was on—

SCAMMONY—A NOVEL ADULTERANT.

BY MICHAEL CONROY, F.C.S.

Perhaps no drug contained in the *materia medica* has received so much attention from dishonest dealers as scammony; but the adulteration hitherto practised has been so clumsily and ignorantly effected, and the articles used for the purpose have been so simple, that a few easy tests have sufficed for their detection. Among these tests the one mostly relied upon is the extraction and estimation of the resin by means of ether. No longer, however, will the test be so simple, for a genius has arisen in the East who has found a plan of producing the gum otherwise than by the poetical manner of collecting the milky juice in mussel shells, so ably described by Mr. Maltass, of Smyrna. This scammony may not be of the same therapeutic value as that known to Theophrastus in the third century B.C., nor as that described by Hippocrates or Dioscorides, nor yet as what Helias, patriarch of Jerusalem, sent to our king, Alfred the Great, but still it is not as bad as many other samples to be found in the market.

This sample, which represented a direct importation from Constantinople, came into my hands a few days ago for the purpose of analysis. It consisted of several small pieces which had apparently been broken off large thick cakes, with the object of obtaining a representative specimen of the bulk from which they were taken. These were of a uniformly dark ash-grey colour, breaking easily and presenting a resinous, shiny black fracture, indistinguishable from pure virgin gum. Triturated in a mortar the pieces were easily reduced to a buff coloured powder, somewhat darker than what is

usually obtained from the virgin gum. This powder formed a very nice emulsion with water, and in other respects appeared quite satisfactory. To ether it yielded 83·8 per cent. of a nice amber-brown resin, and a decoction of the residue when cooled was turned blue by iodine, as is usually the case with nearly all commercial specimens. The starch thus indicated was found by the microscope to be wheaten. So far nothing arose to create suspicion; but on examining the resin obtained by the extraction with ether, I was at once struck by its peculiar smell, which recalled the odour of the resin prepared from the root by means of alcohol, pharmaceutically known as scammony resin. This caused me to powder another portion of the sample, which on comparison with a sample of true virgin powder, at once revealed the presence of the resin prepared from the root. There is no mistaking the distinctive odour of this resin, and its presence will reveal itself by its very peculiar and persistent leathery odour, while the true gum possesses, quite as distinctive a sour, cheese-like odour; and there is no doubt that this parcel has been made up of some skillip scammony and resin prepared from the root. It is the first time that I have met with this adulterant, and since my examination of the parcel I have learned that though containing 83·8 per cent. of resin, it was offered at four or five shillings below the market value of virgin gum. Samples are on the table of both the gum and powder, together with a sample of true virgin powder for comparison.

A vote of thanks was passed to Mr. Conroy.

A paper was then read entitled—

ACONITINE FOR INTERNAL ADMINISTRATION.

BY T. B. GROVES, F.C.S.

From a perusal of an article, "Preparations of Aconite," in No. 5, vol. i., of Dr. Squibb's *Ephemeris*, it would appear that aconite plays a more important part in medication on the other side of the Atlantic than it does in this country. Here the admitted uncertainty of action, both in degree and kind, of the official preparations of the drug seems to have had the effect of dismissing both drug and preparations from the medical armoury: there, on the contrary, this feeling serves but to stimulate research with the view of providing for medical practitioners a trustworthy preparation of a drug

of admittedly high value. Pharmacists cannot but feel greatly indebted to Dr. Squibb for his able article on the subject, although his conclusions may not meet with universal acceptance. In fact, it seems to me that to decide, after all the labour that has been expended on the chemistry of the aconite alkaloids by Wright, Dequesnel, and others, on recommending for internal use a fluid extract of a root that varies so greatly in activity, is a distinct retrogression in pharmacy tending to render useless a vast amount of original research conducted with unusual care and completeness. It is true that Dr. Squibb has indicated a method of estimating by the sense of taste the quality of the root, but such a method, crude in extreme as it must be in any case, would be unable to distinguish between roots differing widely in their chemistry and physiology, like *A. Napellus* and *A. Ferox*. In fact, the latter, owing to the less amount of acrid resin it contains, would give a less marked result than its less potent congener. It is not pretended that the subject has been exhausted. New varieties of root have from time to time made their appearance in the market, and though the chemist has essayed to perform his part in their examination, he has not been adequately seconded by the experimental physiologist. The legal difficulties in the path of inquiry in this direction may well account for the apparent and probably only apparent lack of interest among the medical profession in a class of remedies so potent for good or evil as the various alkaloids of the genus *Aconitum*.

Practically we may, I think, limit our attention to one species only of the toxic aconites. *A. Napellus* is that which has, I believe, been invariably ordered in the manufacture of what may be termed crude aconite preparations for internal use, and it is to it that the text-books refer when treating of the physiological properties of aconite. Its alkaloid, nap-aconitine, has been examined and described by several experimenters, so that its identification when in a pure crystalline condition is comparatively easy. Moreover, its precise physiological action has been studied by Dr. Fraser, of Edinburgh, who compared its action with that of fer-aconitine (the so-called pseudaconitine of Von Schroff), who reported thereon to the British Association at the Bradford meeting in 1873. His results, which are given in short abstract in the Annual Report, point to the necessity of discriminating between the two alkaloids when used for internal administration. But can they be with certainty discriminated? Undoubtedly, and it is the more necessary to take precautions in this direction, owing to the fact which Wright

has pointed out, that *Aconitum Napellus* yields both nap-aconitine and fer-aconitine,—the latter in very small proportion, it is true, but still enough to modify in a sensible degree the action of its companion alkaloid. That the more powerful *A. Ferox* has frequently (probably as often as procurable) been employed for the extraction of commercial aconitine is unquestionable. The element of uncertainty thus introduced has perhaps had much to do with the neglect with which English practitioners have treated aconitine as an internal remedy; a neglect which is seen to be fully justified when it can be shown that of the commercial aconitines, so-called, many are wholly amorphous and therefore indefinite in character; whilst others are not only so, but are also contaminated with aconite alkaloids without toxic properties, and of little physiological activity of any kind.

Mr. Cleaver has pointed out the source of one such possible contaminant in *A. paniculatum*, which he states yields an inert alkaloid identical with that provisionally named picraconitine, which I extracted in quantity from a batch of so-called *A. Napellus*. I at first supposed it to be identical with atisine, the alkaloid of *A. heterophyllum*, but I was assured by Dr. Broughton, who saw my specimens, that such was not the case, an opinion afterwards borne out by the results of combustions carried out in the laboratory of Dr. Wright.

I would recommend to any one setting about the preparation of nap-aconitine for internal administration to be very careful in the selection of his roots. If possible, they should be grown in this country, with guarantee from the grower that they are the produce of *A. Napellus*. Mr. Holmes, will soon, I hope be able to tell us more about the numerous varieties of this plant, and their relative degrees of toxicity.

To him we also hopefully look for showing us how to recognise them by optical means, microscopic or otherwise, as well as how to distinguish between the dried roots of *A. Napellus* and *A. paniculatum*.

Having obtained by following Stas' general method of extraction the crude alkaloids of presumably true roots, the aconitine before it can be safely used for internal exhibition must be separated in a crystalline condition. This is not difficult, but it is wasteful, if such a term can be permitted in this connection. Ordinary skill only is required, helped by extraordinary patience. As I pointed out so long ago as 1866, the nitrate is the best of its salts to crystallize, a fact I had demonstrated two years previously. I have

never failed in producing it in quantity averaging, perhaps, one third of the total yield of alkaloid. From the nitrate the pure alkaloid or any of its salts can be made without difficulty.

It fortunately happens that the nitrate of fer-aconitine is crystallizable only from a strongly acid solution. It is therefore necessarily excluded from the crop of crystals obtained from a neutral or nearly neutral liquid.

There remains the possible admixture of picraconitine, the nitrate of which crystallizes in forms so like those of nap-aconitine that by an ordinary observer they would not be distinguishable. Its bitterness is its most patent distinction. The poisonous aconitines are much less bitter. Moreover, its comparative solubility in dilute ammonia is characteristic; so that a nitrate of aconitine that yielded on precipitation with dilute ammonia a proportion of alkaloid much less than that due to its centesimal composition would deservedly be suspected. However, the best test of all would be the physiological applied to each batch of alkaloid by a competent experimenter; and were a series of preparations so guaranteed produced by a house of known reputation, I am confident that in the course of a short time they would be accepted by the medical profession as a valuable addition to the list of heroic remedies.

The PRESIDENT having moved a vote of thanks to Mr. Groves for this last contribution of his to the literature of aconite,

Dr. WRIGHT said he could only regret the retrogressive action of the American Pharmacopœia Committee on this question. Some two or three years ago, while the revision was in progress, he was applied to by Dr. Rice, the Chairman of the Committee, to draw up a kind of *précis* of the general chemical and physical characteristics of the various aconite alkaloids as far as then known, and he was in hopes that the information then extant would have sufficed to have convinced the Committee that there was quite a possibility and practicability of having one uniform alkaloidal preparation which might be prescribed, instead of an uncertain tincture such as was ultimately adopted. With reference to another point, that the nitrate of aconitine was a convenient sort of preparation, he should say that the hydrobromide was almost as convenient for various purposes, especially considering its sparing solubility, and was not open to an objection which nitric acid was open to, that a certain amount of decomposition rendered further purification necessary. He believed Dr. Stephenson was carrying out some investigations

with regard to the physiological character of the various alkaloids, for at the time of the Lamson trial, he supplied him with samples for the purpose, and he hoped that before long he would afford some valuable light on that subject.

Mr. WILLIAMS said he could hardly say much at so late an hour on this subject; but he was rather bound up to a form of this alkaloid, namely, the amorphous form, which had been prepared and used medicinally for upwards of fifty years, and with which he had been more or less connected through the late Mr. Morson. He could hardly agree with Mr. Groves, that they ought to change the form, and go to a crystallized article, his own belief being that a crystallized aconitine was not physiologically so active as the aconitine produced or discovered many years ago by Dr. Turnbull. He could hardly give any opinion on Mr. Groves's suggestion, except to say that it was not in accordance with his present views.

The next paper was on—

THE COMPOSITION OF EASTON'S SYRUP.

By ROBERT H. DAVIES, F.I.C., F.C.S., AND EMIL B. SCHMIDT, PH.D.

During the recent examination of some samples of this syrup, the proportion of alkaloid present was found, in some cases, to differ from that prescribed in such a marked manner that a more detailed examination was undertaken, with a view of drawing the attention of pharmacists to the variations of strength occurring in this preparation.

Easton's syrup professes to contain "about 1 grain phosphate of iron, 1 grain phosphate of quinia, and $\frac{1}{32}$ grain phosphate of strychnia in each fluid drachm. This statement is made by Mr. Squire,* and a formula given for making the syrup which is called, "Dr Easton's formula."

Proportion of Quinia Phosphate.—If the directions given here are carefully followed, the product will measure between 24 and $24\frac{1}{2}$ fluid ounces, and will contain the quinia phosphate derived from 192 grains of sulphate. Approximately, then, 1 grain sulphate of quinine has been used in the production of one fluid drachm of syrup. The formula of quinia phosphate corresponding to the soluble or neutral sulphate would be $(C_{20}H_{24}N_2O_2)_3, (H_3PO_4)_2$. We may assume with a high degree of probability that this is the phosphate present. One hundred grains of sulphate would yield

* "Companion to the British Pharmacopœia," 13th edition, p. 148.

nearly 87·5 grains of phosphate; therefore under the most favourable circumstances the syrup could not contain more than 0·875 grain of phosphate of quinia per fluid drachm. The amount of this latter in a sample of syrup prepared in accordance with Dr. Easton's formula, deduced from the amount of alkaloid extracted, was 0·814 grain per fluid drachm, that is, 6·51 grains per fluid ounce; whereas in various other samples of commerce the amount of phosphate of quinia was as follows:—

Sample of Syrup.

Grains of Phosph. of Quin. per fluid oz. :—

A.	B.	C.	D.	E.	F.	G.	H.	J.	N.	Own.	Theory.
1·57	7·83	6·54	6·58	4·95	3·15	5·80	7·13	2·72	4·59	6·51	6·87

A certain sample, which was prepared in accordance with the Pharmacopœia of the United States, yielded alkaloid corresponding to 8·56 grains quinia phosphate per fluid ounce.

Mode of Estimation.—10 c.c. of the syrup were mixed, in a separating funnel, with 20 c.c. dist. water, 3 c.c. liq. ammon. fort. added, and, after shaking, 25 cc. of a mixture of equal volumes of chloroform and ether, and the whole agitated for three or four minutes. After complete separation of the aqueous and chloroformic solutions, the latter was drawn off, and passed through a small dry filter into a weighed beaker. When this treatment had been repeated with 20 c.c. of the ether-chloroform mixture to extract any remaining alkaloid, the united ethereal liquids were evaporated by immersing the beaker into a warm water-bath. The residue was finally dried in the air-bath at 100° C., and weighed.

The residual alkaloid should be resinoid in character; if crystalline, it is highly probable that the quinine employed was contaminated with other alkaloids. When dried at 100° C., it should weigh 0·128 gram, of which 0·0057 gram is to be deducted for strychnia, leaving 0·1223 gram from 10 c.c. syrup, which corresponds to 6·51 grains of phosphate of quinia per fluid ounce, the quantity which was experimentally obtained from a carefully and freshly prepared sample of syrup. The alkaloid extracted from the same commercial specimens varied from 0·034 gram to 0·152 gram per 10 c.c., the theoretical yield being 0·135 gram per 10 c.c.

Proportion of Ferrous Phosphate.—In producing the 24 fluid ounces of syrup by Dr. Easton's formula, we are directed to decompose 300 grains sulphate of iron with 360 grains phosphate of soda. Mr. Squire mentions that the quantity of sodium phosphate is not sufficient to precipitate the whole of the iron. As a matter of fact, if the 300 grains were entirely converted into phosphate,

they would only form 128 grains of ferrous phosphate, $\text{Fe}_3, 2\text{P O}_4$, which would give a maximum of $5\frac{1}{3}$ grains per fluid ounce, instead of the 8 grains as given in the formula. But even that amount of $5\frac{1}{3}$ grains per fluid ounce is most probably not reached, since in the process of decomposition a quantity of sulphuric acid becomes liberated, which doubtless prevents a portion of the ferrous phosphate from being precipitated.

Mode of Estimation.—We have not succeeded so far in separating iron in the ferrous condition from any that may be present in the ferric state. The results given as ferrous phosphate assume that the whole of the iron present is present as this salt.

Five c.c. of the syrup are evaporated on a water-bath in a platinum dish, then carefully incinerated, the ash extracted with hot hydrochloric acid, and washed on a filter; the ferric chloride in the hot filtrate is reduced by solution of stannous chloride, which is added until the solution becomes colourless. Excess of this reagent is removed by the addition of mercuric chloride, and the amount of ferrous salt determined by titrating with a half decinormal solution of potassium bichromate.

The amount of iron present in the samples examined would be equivalent to the following proportions of ferrous phosphate:—

Sample.

Grains of Ferrous Phosph. per fluid oz. :—

A.	B.	C.	D.	E.	F.	H.	J.	Own	Theory.
0.97	1.99	12.32	8.46	7.2	8.72	6.89	8.72	4.7	5.3

The amount present theoretically is 5.3 grains, and that found in the sample made by us was 4.7 grains per fluid ounce.

Proportion of Strychnine.—The small proportion in which strychnine is present in this preparation, rendered it necessary to depart from the usual mode of extracting and weighing the alkaloid. We had recourse therefore to a colorimetric method for the approximate estimation of this alkaloid when it is present in very small quantity.

The alkaloidal residue from 10 c.c. of syrup was dissolved in 31.25 c.c. of water acidulated with sulphuric acid, 1 c.c. normal acid was employed, and 5 drops of this solution were added to 4 c.c. of concentrated sulphuric acid tinted yellow with potassium bichromate. The depth of colour produced after standing five minutes was then compared with the colour produced by known quantities of very dilute solution of strychnia of known strength in the same sulphuric acid coloured with bichromate.

This method was devised about two years ago by Mr. Oscar

Eckenstein, in conjunction with one of us. By operating as above it is possible to detect strychnine in one drop of a solution of strychnine one-fiftieth the strength of the official liquor strychniæ; that is, containing 1 of strychnine in 5,500 about. As a quantitative method it leaves much to be desired.

The results yielded led to the following conclusion :—

Sample.

Grains of Strychnine in 4 fluid oz. :—

A.	B.	C.	D.	E.	F.	G.	H.	J.	N.	Own.	Theory.
1-1-2	3	·8-1	·6-8	·8-1	·6-8	·6-8	1-2	·6-8	·6-8	·8	1

The sample prepared by us showed ·8 grain in 4 fluid ounces; by this test theoretically 1 grain should be found in this quantity.

In connection with these results it must be borne in mind that the method as a quantitative one is only approximately correct.

The only sample with which we would find fault on account of the strychnine is sample B., where it would appear that about three times the amount is present that ought to be found.

Phosphoric Acid.—Qualitative testing for sulphates having shown that these were not present in any case in more than traces, and chlorides being proved absent, the total free acid was estimated by means of volumetric solution of soda, and the proportion which might be considered to be in combination with the alkaloids present having been added, the whole calculated as phosphoric acid.

A singular circumstance is to be observed in effecting this estimation: when about five-sixths of the soda solution necessary has been added, and indeed, from this period until the end of the operation, the liquid distinctly reddens blue litmus paper, and at the same time colours red litmus paper blue. To the blue paper the liquid behaves as an acid solution, whilst to the red paper it is alkaline in character with almost equal distinctness. It is impracticable to employ a solution of litmus, and, using litmus paper, the operation may be considered finished when both colours undergo, as far as possible, the same amount of modification.

Ten c.c. of the sample diluted to 50 c.c. required from 4 to 11 c.c. of normal solution of soda; this corresponded to the following proportions of phosphoric acid present :—

Sample.

Grains Phosphoric Acid in 1 fluid oz. :—

A.	B.	C.	D.	E.	F.	G.	H.	J.	Own.	Theory.
19-36	20	33-56	46-24	49-24	43-44	48-24	46-6	47-76	37-68	38

A sample made by us yielded 37-68 grains per fluid ounce, and the theoretical amount is 38 grains.

The results given above, together with the specific gravity of

Table of Composition of Easton's Syrup.

Sample.	Theory.	Own Sample.	A.	B.	C.	D.	E.	F.	G.	H.	J.	N.	Grains per fluid ounce.
Quinia Phosphate . .	6·87	6·51	1·57	7·83	6·54	6·58	4·95	3·15	5·8	7·13	2·72	4·59	
Ferrous Phosphate. .	5·3	4·7	0·97	1·99	12·32	8·46	7·2	8·72	—	6·89	8·72	—	
Phosphoric Acid . .	38·03	37·68	19·36	20·00	33·56	46·24	49·24	43·44	48·24	46·6	47·76	—	Grains per 4 fluid ounces.
Strychnia.	1	·8	1·1·2	3	·8·1	·6·8	·8·1	·6·8	·6·8	1·2	·6·8	·6·8	
Specific Gravity . .	—	1270	1326	1296	1324	1331	1306	1309	1288	1314	—	1288	

each sample, have been tabulated for convenience. The samples examined were obtained in the ordinary way of business from makers or retail dealers. In our opinion their varied composition points conclusively to the desirability of some official and authoritative formula for the manufacture of this important preparation.

A vote of thanks having been carried to Mr. Davies,

Mr. PLOWMAN said it appeared from the perusal of this paper that no method had been proposed for separating the cinchona alkaloids one from the other. The residue from the mixture of chloroform and ether had been taken as pure quinia, and this seemed to him to be a serious blemish in the paper.

The next paper was on—

THE ODOROUS PRINCIPLE OF HENBANE LEAF.

By A. W. GERRARD, F.C.S.

A few years ago some fresh henbane leaves I received particularly attracted my attention by their unusually strong but very characteristic odour. As nothing appeared to be known or published concerning this odorous body, I felt a desire to attempt its extraction and investigate its characters. The leaves being required for the preparation of hyoscyamine, I could not follow the usual method of distillation, for fear of injury to the alkaloid; so I attempted the separation of the odorous principle by the following process, which proved a success.

Process of Extraction.—The leaves in separate portions were washed in about a litre of ether until ten pounds had been treated; this yielded a chlorophyll coloured fluid, which was allowed to spontaneously evaporate, giving as a residue a semi-fluid green extract. The extract washed with water to remove adhering alkaloid or other matters was set aside. After the lapse of some months the extract was noticed to have deposited some crystals of brilliant iridescence, likewise some granular matter. Deposition was allowed to continue until it appeared arrested. The solid matters were now separated by straining and gentle pressure, and the soft residue purified by several solutions in and separations from ether. In this way I obtained 2·6 grams of substance, which on examination proved to be the odorous principle of henbane.

Properties.—It forms a pale yellow, unctuous, semi-crystalline mass, having the appearance of a stearopten. Its odour was that

of henbane, at the same time suggestive of butyric acid. Its reaction to litmus was acid, taste acid and slightly acrid; like many essential oils its vapour exercised a bleaching action on cork. It was freely soluble in alcohol, ether, chloroform, and carbon disulphide. Heated, it fused and volatilized; its vapour burnt with a yellow, smoky flame, leaving a slight carbonaceous residue, which entirely disappeared on further heating. Examined with a lens, numerous crystalline plates were observed. It was heavier than water; its sp. gr. taken by floating in sulphate of magnesium was found to be 1061. With strong sulphuric acid it gave a brown colour; strong nitric acid did not appear to affect it.

My suspicions from its odour were that this body might be an ether or compound of butyric acid. A portion was saponified with soda, then treated with hydrochloric acid in excess; the clear acid solution on separation smelt strongly of butyric acid, and gave, when neutralized and treated with cupric sulphate, the green precipitate characteristic of cupric butyrate. The foregoing characters give evidence that the odorous principle of henbane is a butyric ether, or it may be a butyrin, several of which are described in Watts' "Dictionary of Chemistry" as having properties in general with the body I have obtained.

In addition to the odorous principle, I found in the ether residue some fixed fat and a pungent tasting resin.

Practical Bearing on the Pharmacy of Tincture of Henbane.—It is well known that some tinctures of henbane give a turbidity when diluted with water, whilst others do not; also that the tincture gradually loses its green colour, forming a dark deposit. As regards the former, it has been stated that the difference is due to the use of annual and biennial henbanes, a tincture of the latter only giving turbidity. This statement is not the fact, as I have found the tincture from both varieties when freshly made equally give turbidity; it is true that a difference is sometimes observed, and may be attributable to the period at which the plant has been gathered, and the extent to which the odorous principle and fat has developed. Many samples of tincture of henbane almost entirely lose their property of becoming turbid with water; this is generally the result of age, for such a tincture will be found to have lost its original green colour and changed to a brown, with formation of the usual dark deposit. Thus deposition and disappearance of turbidity are simultaneous and proportionate. As to the nature of the deposit in the tincture, I believe, if examined, it will be found to consist of a mixture of odorous principle, fat, and

chlorophyll, the separation of which is slowly effected by the agency of the water in the proof spirit; if this be so, then it is an argument for the use of a stronger alcohol in making tincture of henbane.

A vote of thanks was passed to Mr. Gerrard.

The last paper read was entitled—

SUGGESTIONS FOR COMBINATIONS OF COLLODION.

By J. B. BARNES, F.C.S., *Pharmaceutical Chemist*.

Having witnessed the good effects of the compound solution of salicylic acid and collodion when applied to corns as recommended by Dr. Traill Green,* I am disposed to believe that the use of collodion as a medium for the topical application of several other substances might be advantageously extended; already we are familiar with such preparations as collodion epispasticum and collodion stypticum, for which Mr. Martindale, in the "Extra Pharmacopœia," gives formulæ as well as for collodium c. oleo crotonis, collodium iodi, and collodium iodoformi.

The advantages of combinations of collodion are that, unlike ointments, they remain fixed for some time to the part applied, and are cleanly. It remains, however, to be proved whether the remedial effects of the several substances in combination with it will be obtained; collodion must retard the action more or less of all of them, but at the same time it is reasonable to expect some of those under consideration may be found useful. It is not for the pharmacist to determine the strength of such combinations,—that has to be decided by the prescriber,—but it is within the province of the former to discover by experiment the proportions suitable for combination.

I find when wood tar is mixed in the proportion of 1 drachm by weight with 4 of collodion a perfect solution is effected, which, when applied to the body, dries quickly and leaves a smooth covering.

Coal tar collodion may also be prepared by mixing, in the same proportions, an alcoholic extract of coal tar of the consistence of syrup with collodion; it is fluorescent in appearance, and forms a good covering when applied to the skin. The addition of 30 grains

* *Pharm. Journal*, April 28th, 1883, p. 884.

of iodine to the fluid ounce of either of these preparations does not affect its consistency or adhering properties.

Oleum picis juniperi, when mixed in the proportion of 1 by weight to 5 of collodion, dissolves and forms an application which when applied to the skin dries quickly, leaving a good covering.

Oil of gurgun, in the proportion of 1 by weight to 3 or 4 parts of collodion, also dissolves and forms a good varnish.

Oleic acid and Peruvian balsam, each in proportion of 1 by weight to 4 of collodion, form good varnishes when applied to the skin, which require ether to remove them.

The following also form suitable combinations for painting on the skin, adhere firmly, and do not crack. Glacial acetic acid, 1 part by weight; flexible collodion, 4 parts; carbolic acid, in crystals, 1 part to 4 of flexible collodion; creasote, 1 part by weight to 7; and essential oil of mustard, 1 part by weight to 7 of flexible collodion.

Belladonna collodion may be prepared by macerating 60 grains of the alcoholic extract in a fluid ounce of flexible collodion for twenty-four hours and decanting the clear liquid; when spread upon the body it leaves a smooth surface.

Aconitia, atropia, hyoscyamia, and veratria dissolve very readily in collodion, the latter alkaloid in the proportion of 8 grains to 7 fluid drachms of flexible collodion and 1 fluid drachm of oleic acid, when applied to the skin leaves a smooth covering, which does not rub off.

Morphia does not dissolve in collodion, but when in combination with oleic acid it does; 5 or 10 grains in a fluid drachm of the acid with 7 drachms of flexible collodion forms a covering which adheres firmly to the skin.

Ammoniated mercury, iodide of lead, and precipitated sulphur, each of them mixed with flexible collodion in the proportion of 1 drachm to 7 and 4 or 5 drops of castor oil, form mixtures which adhere firmly to the skin.

Oleate of mercury mixed with collodion in the proportion of 1 to 4, when extended on the surface of the body, leaves a smooth almost transparent covering.

In the preparation of the oleate 1320 grains of oleic acid were diluted with three volumes of ether; 420 grains of dry binocide of mercury was added, and the mixture shaken occasionally for four days until the orange colour of the binocide had disappeared; the white creamy compound was allowed to evaporate without the application of heat. The dilution of the oleic acid with ether pre-

vents caking, the oleate of mercury so obtained is of a yellowish-white colour, of the consistence of vaseline.

Oleate of zinc mixed in the proportion of 1 part to 4 of collodion forms a convenient mixture for topical application.

Iodide of cadmium dissolves in the flexible collodion; 1 drachm mixed with 7 fluid drachms of the collodion and 4 drops of castor oil, gives a colourless bright solution, which, when painted on the skin, leaves a smooth white covering.

I have not been successful in preparing a smooth, transparent collodion of iodide of sulphur. The iodine dissolves out and the sulphur subsides, 50 grains of iodide of sulphur treated with ether yielded 10 grains of sulphur, the exact proportion given in the Pharmacopœia, obtainable when 50 grains of the iodide is boiled with water and the iodine driven off.

My sample of this substance obtained from a firm of well-known manufacturing chemists was now mixed in the proportion of 1 to 60 of glycerine, it appeared to dissolve, but the sulphur gradually subsided.

A vote of thanks was passed to Mr. Barnes.

GENERAL BUSINESS.

Mr. PLOWMAN said he rose to perform a very pleasant task. It was hardly necessary to inform the members of the Conference that through the generosity of Mr. Thomas Hyde Hills a fund had been provided for giving a number of books to be presented to the Associations of those towns where the Conference might meet from time to time. In the case of Southport there had been, up to the present time, no Association, and hence some little difficulty arose; but after correspondence between the honorary general secretaries acting for the Executive Committee and the Southport authorities, it was decided that the books should be granted on condition that they should be taken care of by the local secretary of the Pharmaceutical Society for the time being, and that they should form the nucleus of a library. The books were now on the table for formal presentation to Mr. Ashton, and he could only express a hope that the library would grow as rapidly and with the same signs of permanence as the town of Southport. He must add that besides the Bell and Hills gift were two volumes given by Mr. Thomas Hanbury

in memory of his brother, Mr. Daniel Hanbury, namely, "The Science Papers," and "Pharmacographia."

Mr. ASHTON, on behalf of the pharmacists of Southport, begged to heartily thank the committee and trustees of the fund for this gift. According to the arrangements made there was every prospect that in a little time the number of books would be considerably augmented, and he was sure they would be much appreciated by the chemists of Southport.

PLACE OF MEETING FOR 1884.

Mr. BENDER said the members were aware that it was the custom of the Conference to accompany the British Association to its various places of meeting. They would also remember that last year, when it was decided the British Association should go to Canada next year, it was felt that it would not be wise to attempt to follow them on that occasion. Hearing of this, the chemists of Aberdeen and the North of Scotland forwarded a cordial invitation to go there next year. A good deal of correspondence took place and arrangements were almost completed, but within the last few days a new aspect of affairs had arisen. The British Association, it was understood, would probably go to Aberdeen in 1885, and under those circumstances, the Aberdeen chemists had withdrawn temporarily their invitation, so as to give the Pharmaceutical Conference an opportunity of accompanying the British Association when it did go there. They were not, however, left homeless. The President had previously had some correspondence with a gentleman in the South of England, and having heard that they were now open, he had sent in the name of the chemists of Hastings and St. Leonards a very cordial invitation to the Conference to meet there next year. Having read the letter of invitation, Mr. Benger concluded by moving that this cordial invitation be as cordially accepted, and he hoped that the meeting might prove as satisfactory in the South of England as the present one had in the North.

Dr. QUINLAN seconded the proposition.

The PRESIDENT, in putting the resolution, explained that the invitation was quite spontaneous; it had been made to him privately some two months ago, but it was then held in abeyance owing to the expectation that they would go elsewhere. It had now been renewed in the cordial spirit which they had heard from the letter.

The resolution was carried unanimously.

ELECTION OF OFFICERS.

The PRESIDENT said the Executive Committee had now to present the list of suggested names of officers for the ensuing year. As he had before stated, the Committee, had done its best to select the names of those who would be likely best to serve the Conference, but at the same time any member was quite at liberty to suggest any other names.

Mr. BENDER explained that one or two blanks were left for local officers who would be appointed by the Executive Committee later on, if that met the approval of members.

A resolution was accordingly passed unanimously, entrusting to the Executive Committee the duty of appointing local officers for the ensuing year.

The list of names suggested having been read, Mr. Nesbit and Mr. Chipperfield were appointed to act as scrutineers.

Mr. STEPHENSON (Edinburgh) then moved :—

“That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the Local Committee, and especially to Messrs. Radley, Ashton, Ball, and Kershaw, for the very successful manner in which the various arrangements connected with the Southport visit have been carried out.”

He was sure the Executive Committee had correctly gauged the feelings of the meeting in giving priority to this resolution, and possibly the same feelings of propriety had influenced them in assigning it to his hands, he being a comparative stranger among the non-resident visitors. The welcome they had received from the pharmacists of Southport, the kindness and hospitality which they had experienced and further expected to experience, were so marked that it was quite unnecessary to say a single word in support of the resolution. The members of the different localities where the Conference met seemed to vie with each other in hospitality, so that it would be a difficult matter for any town to surpass previous efforts; but without making any invidious comparisons, he might express his own feelings that the Southport people had quite held their own, and it must be very gratifying to them to know that this had been without exception the most successful meeting in point of numbers which the Conference had yet held.

Mr. TAYLOR had the greatest pleasure in seconding the resolution so ably moved by Mr. Stephenson.

Mr. BENDER said he had had rather special opportunities of coming in contact with members of the Committee, having had occasion to visit Southport several times during the past year. He could only say that so far from having to use any influence he might possess in the way of stimulus, he had rather to act like the guard at the tail of a train, and endeavour occasionally to put on the brake; however, he must say that the brake did not act very well. It would have been a hard thing to check the generous enthusiasm of the Local Committee and their friends.

The PRESIDENT said not only as President, but as one who had been in the town several days before the meeting commenced, he had seen something of the work of the Local Committee. He had been struck with the admirable organization, great enthusiasm, and entire heartiness with which the local members of the Conference had thrown themselves into the work of entertaining the visiting members.

The motion having been carried unanimously,

Mr. RADLEY (Chairman of the Local Committee), begged to thank the members for the handsome compliment which had been paid them. It was their great wish that the Conference should have a hearty reception, and it would be a very pleasant reflection that their efforts had been so much appreciated. One great advantage which arose out of these Conferences was the very pleasant meetings of the Committee which had taken place, and the introduction of brethren from neighbouring towns to each other. He trusted this would be the starting-point of a local association, which might become very powerful for good in the future.

Mr. ASHTON (Local Secretary) said it had been a labour of love to all the Committee. They had had many pleasant meetings together, everything had gone on straightforwardly, and he was quite certain that it had been the means of bringing together some gentlemen who were not in the habit of meeting before, and that the same kindly feeling was engendered in every place which the Conference visited.

(The scrutineers here returned and announced that the election was unanimous, only one paper having been slightly altered, and that not to erase any gentleman's name, but to suggest an alteration in his position.)

OFFICERS FOR 1883-84.

The following was the list of officers elected :—

President.—J. Williams, F.I.C., F.C.S.

Vice-Presidents.—M. Carteighe, F.I.C., F.C.S., London; J. R. Young, Edinburgh; S. R. Atkins.

Treasurer.—C. Ekin, F.C.S., Hounslow.

Honorary General Secretaries.—F. Baden Bengier, F.C.S., Manchester; S. Plowman, F.I.C., London.

Other Members of Executive Committee.—J. Borland, F.C.S., F.R.M.S., Kilmarnock; J. C. C. Payne, Belfast; W. A. H. Naylor, F.C.S., London; W. V. Radley, Southport; W. Hills, F.C.S., London; G. S. Taylor, F.C.S., London; J. C. Thresh, D.Sc., F.C.S., Buxton; J. B. Stephenson, Edinburgh.

Auditor.—T. H. Sykes, Southport.

Mr. BRUNKER said that whilst fully concurring in the vote of thanks which had been passed to the Local Committee, he felt that the visiting members would be guilty of a great omission if they were not to express their cordial thanks to the public bodies which had done so much for the entertainment of the visitors. He would, therefore, propose—

“That the best thanks of this meeting be given to the Chairman (Ed. Holden, Esq.), the Directors, and the Manager (Mr. Howorth), of the Victoria Baths Company for their kindness in giving a special swimming entertainment to members of the Conference. Also to the Chairman (Ed. Holden, Esq.), the Directors, and the Manager (Mr. Nightingale) of the Glaciarium Company, for granting admission to the Glaciarium and allowing members to inspect the works.”

Mr. NAYLOR seconded the resolution, which was carried unanimously.

Mr. JOHN WILLIAMS moved the next resolution, viz :—

“That the hearty thanks of the Conference be accorded to the President for the very able and courteous manner in which he has conducted the business of the meeting.”

If he were to say what he should like, and perhaps ought, to say in support of this resolution, he should require a considerable time but at that late hour he felt sure he should best serve the interests

and consult the feelings of the meeting by not attempting to say much. He must say one thing, however, that so ably had the President conducted the business of the Conference, and so much were they indebted to him for the admirable discourse which he had delivered, that it made one tremble to think that whoever followed him must inevitably by comparison fail. For himself, he should have to throw himself on the indulgence of the members, and could hardly hope in any way to emulate the admirable performance of the President.

Mr. A. H. MASON said the resolution really did not require a seconder, but simply as a matter of form he would add a word or two. They were not only indebted to Professor Attfield for the ability with which he had presided over the meetings, but, as Mr. Williams had said, for the two able addresses which he had delivered. Most of them would feel that it might have been more congenial to the tastes of Professor Attfield to deliver addresses having a more scientific aspect; but he had sacrificed his own feelings and considered only the position of the members at large in giving these two discourses on the relations of pharmacy to the State, and the relations of the State to pharmacy. When Mr. Kershaw moved a vote of thanks to Professor Attfield the other day, a hint which he took upon himself to ask the meeting to endorse was most enthusiastically received, viz., that a copy of these addresses might be distributed to every member of Parliament. If it were necessary that a resolution should be passed authorizing the incoming executive to undertake that work, he was sure it would receive cordial approval, but that would not be necessary if the members showed their approbation in the usual way. He might state, also, that it would not be a costly proceeding, the addresses being already in type. If any of them had seen the *Times* of that day they would have noticed a very pertinent article dealing with the address, in which the editor took up the position put forward by the President, namely, that pharmacists had to undergo a certain education, etc., for the benefit of the State, and that the State did not provide a *quid pro quo*. An old philosopher said there was nothing like agitation; even butter was made by agitation. The press was taking this matter up, and at the present time it would be most desirable to send a copy of this address to members of Parliament. In conclusion, he could only say that it was with extreme regret that he noticed Professor Attfield's name was obliterated from the list of officers handed round, but he was quite sure that although his name was not there his heart would remain with them always.

Mr. PLOWMAN remarked that Professor Attfield still remained vice-president in virtue of having been president, and he would no doubt be present at every meeting of the committee, as he had been since the founding of the Conference.

Mr. SCHACHT, having read an extract from the article in the *Times* referred to, said the machinery for the improved legislation required already existed in the action taken by the Council of the Pharmaceutical Society.

The resolution was then put by Mr. WILLIAMS, and carried unanimously.

The PRESIDENT, in response, said he thanked the members from the very bottom of his heart for the most enthusiastic way in which the resolution had been accepted. He thanked his colleagues, and the members generally, for the support they had given him, and he could not have conducted the business so successfully, as it was alleged he had, had he not had the hearty support of his colleagues on the Executive Committee. Each year there had been present gentlemen who had been former presidents, from whose example he had learnt so much, and who had kindly aided him in conducting the meetings; and he must not omit to refer to the very great service rendered to him personally as President as well as to the meeting, and to every member of the Conference, by the two Honorary General Secretaries, Mr. Bengier and Mr. Plowman. He also begged most heartily to thank the authors of the papers. These meetings, were, after all, to aid the Conference in its objects of prosecuting researches and promoting good fellowship; the former stood first in the official pages, and he had to thank the authors of papers for coming forward, both last year and this, with such valuable communications. He was very proud to see that so many of the authors of papers had been his own old students. He must also thank all who had attended the meetings. He would not suppose that the very large meetings they had had, attended by more members than had ever attended any meetings before—according to the official record within seven of 200—had been brought about on account of his presiding; but he did know and was happy to acknowledge that many gentlemen had come kindly to support him personally. It seemed to be the desire of the meeting that some arrangements might be made by which his address, or the two addresses forming one subject, should be brought before the notice of members of Parliament, and whilst thanking the members most heartily for the great personal compliment to himself contained in the suggestion, he might say that there was no

difficulty in the way of that wish being carried out. The present address was in type, and, through the kindness of the Executive Committee, he had been furnished with a few copies for distribution to the press, and he was glad to see that the distribution already had had such useful results. Last year also, having the intention to complete the subject this year by delivering the second address, he took the precaution of having extra copies of the address supplied to him by the printers, which could now be bound up with the present one, and circulated as desired, and he could only hope that members of Parliament might make good use of them. Mr. Plowman had drawn attention to the fact that he had been able to give his services to the Conference without one single break for twenty-one consecutive years. He was thankful to have had the health necessary to enable him to do so, for he had, of course, to give up a great part of his holiday every year to carry out this work; nevertheless, although it had been somewhat a strain upon him, it had been a work of love, a labour of pleasure, for he felt that as pharmacy had given to him his position,—for he had always been proud to state that he had begun life in connection with science as a pharmaceutical apprentice,—he should do from year to year all he could in support of all the objects of pharmacy, and to promote its welfare. Twenty years ago he aided in founding the Conference; that, therefore, made the twenty-first meeting. He had since aided in maintaining the Conference with the help of its numerous supporters, and now he was proud to think he had helped in conducting the last two of its meetings. Although, perhaps, his health would not enable him to be present at every annual gathering, in future, they might all rest assured that he should be present whenever possible, and that from his position in London he should no doubt be able, and certainly should be anxious, to attend every one of the Executive Committee meetings. Nevertheless, as one of the elected officers, though he still had a position on the committee, he must now bid a loving farewell to the Conference and to the members, thanking them for the kindness they had shown him.

THURSDAY, SEPTEMBER 20TH.

A party of eighty, on the invitation of the Local Committee, left Southport by the 8.10 a.m. train for St. Helens. Special saloon carriages were provided for the accommodation of members. The weather was, unfortunately, as unfavourable as it well could be. The rain poured down persistently, and a thick mist obscured the view of the country. On nearing St. Helens, hundreds of chimneys and mine-wheels suddenly appearing and disappearing in the gloom produced a most weird effect. On arriving at St. Helens the party divided, the majority proceeding to Messrs. Kurtz & Co's Chemical Works. Here Leblanc's process for making sodium carbonate; processes for making caustic soda, bleaching powder, potassium chlorate, etc., were shown, and the principles involved and the details of manufacture were explained by several most courteous guides. Special interest was shown by the members in the very thorough utilization of bye-products. The other members visited the Union Plate Glass Works, Bishop's Flint Glass Works, and Messrs. Bibby & Son's Copper Smelting Works.

The Union Plate Glass Works stand on ten acres of ground, and employ a large number of hands. The operation of casting was not going on, but the immense cast-iron beds—nine inches thick at the side, and twelve inches in the centre—on which the plates are cast were shown. The cast plates of glass are annealed for about four days in flat ovens, and are then ground. The first grinding is with sand, the plate being cemented to a heavy bed with plaster of paris, and a heavy iron plate as large as the glass, being moved back and forth and sideways on the surface by machinery. The next process is similar, but two plates of glass are placed together with emery between, thus grinding each other. This produces a smooth opaque surface, such as is used for door panels, etc. The third grinding is with rouge and felt, which produces a fine polish. The rouge is made by the firm, by roasting copperas.

Space will not allow any further detailed account to be given of the various processes exhibited at these places, but it should be stated that Messrs. Bibby & Sons delayed the completion of the final stage of the copper reduction in order to give the members present an opportunity of viewing it.

Luncheon was partaken of at The Fleece, where Mr. Alderman Harrison occupied the chair. Mr. S. R. Atkins, of Salisbury, in

most felicitous terms proposed the Alderman's health, a toast which was cordially received and responded to in appropriate terms.

The return to Southport was made at 12.45, so that members might be able to attend a garden party given by the Local Committee at the Botanic Gardens, Churchtown. The rain, if anything, had increased in the meantime, but this did not prevent upwards of four hundred ladies and gentlemen being present. They were of course confined indoors, but good entertainment was provided for them in the spacious conservatory by a company of Chas. Hallé's Choir, who sang a number of part songs, glees, and choruses. The band of the 13th Lancashire Rifle Volunteers also performed at intervals during the afternoon. Mr. Leo Grindon delivered to the general audience a popular lecture on some interesting plants, and exhibited to the scientists, more especially, some beautifully mounted specimens of rarities of the vegetable world. The Fernery and Museum also attracted numerous visitors, and so the time slipped pleasantly by. Just before the breaking up of the party the weather cleared up somewhat, and enabled the members and their friends to view the extensive gardens and ornamental water. Finally, the gathering broke up soon after six, amid general expressions of pleasure derived from the meeting, and of appreciation of the efforts so successfully made by the Local Committee for the entertainment of the visiting members during the whole of their visit to Southport.



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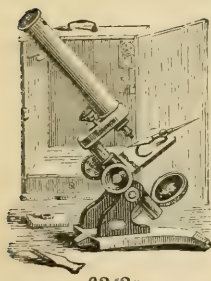
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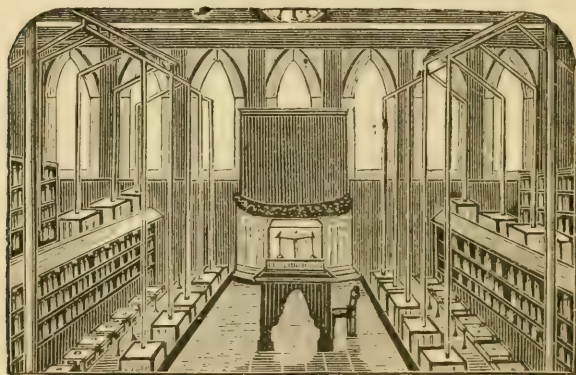
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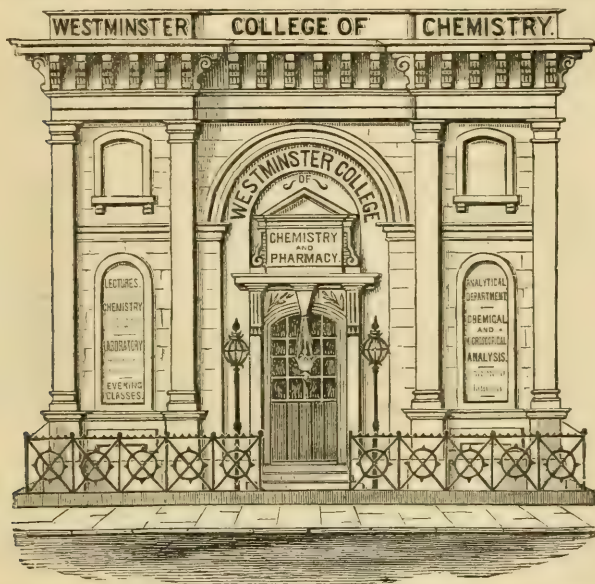
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They were introduced to the medical profession by the present proprietors a quarter of a century ago, and many thousands of unsolicited testimonials have been received from the highest medical authorities, and are now used, and have been used for many years past, by the largest and best conducted hospitals and dispensaries. Of course a success like this has led to many imitations, and highly varnished pills, made to resemble ours, have been introduced by some unscrupulous people. Many of these pills pass through the stomach unaltered, and a useful invention is thus likely to be brought into disrepute.

The most impudent assertions are made by some who combine in one incongruous whole, the trades of druggists' sundrymen, retail druggists, soap-makers, and horse and cattle medicine vendors.

We make and sell nothing but pills, and have testimonials from regular customers, residing in China, Australia, and every part of the civilized world, as well as from friends in almost every town and village in the kingdom; and our trade, which is constantly increasing, is perhaps four or five times as large as all the rest of our copyists put together.

The following are some of our Prices FOR CHEMISTS ONLY:

We strongly recommend our Aperient Pills, as a good general saleable Pill. These, with the Pharmacopœia Pills quoted below, are sent out to every part of the United Kingdom in half-pound parcels, package, postage, and carriage free, on the same day as the order is received; and, to avoid booking and other expenses, 1d. in the shilling will be allowed if stamps or P.O.O. are remitted with order.

Any Pills can also be obtained from any Wholesale Druggist. In ordering, please specify "Cox's Tasteless Pills."

QUOTATIONS FOR OTHER PILLS ON APPLICATION.

No. in Catalogue.	Pil. Aperients et Cathartic.	Prices per Pound in Four or Five Grain Pills.		No. in Catalogue.	Pills of the British Pharmacopœia.	Prices per Pound in Four or Five Grain Pills.	
		Coated.	Un-coated.			Coated.	Un-coated.
1 & 2	Pil. Aper (Cox) c. Cal.	6/-	5/-	122	Pil. Assafœtidæ Co.	6 6	5 6
3 & 4	" " (Cox) sine Cal. . .	6/-	5/-	66	" Cambog. Co. . .	6/-	5/-
193	" Cathartic Fort. (Cox) . .	6/-	5/-	24	" Coloc. Co. . . .	18/-	15/-
332	" Cochia	5/-	4/-	30	" " et Hyos. . .	13/-	12/-
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	PILLS OF THE BRITISH PHARMACOPŒIA.			77	" Ipecac. c. Scillæ .	7/-	6/-
6	Pil. Aloes. Barb. . .	6/-	5/-	99	" Plumbi. c. Opio. .	12/-	11/-
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9	" " et Ferri . . .	5/-	4/-	119	" Saponis Co. . . .	12/-	11/-
10	" " et Myrrh . . .	12/-	11/-	321	" Scammon Co. . .	22/-	21/-
7	" " Soc.	6 6	5 6	115	" Scillæ Co. . . .	5/-	4/-

The Registrar of Trade Marks (after giving the usual public notice prescribed by Parliament, to allow of opposition) has granted us the above "Trade Mark," thus officially recognizing us as the "Original Maker of Tasteless Pills," and no Pills will be sent out without this Mark on all bottles or packages.

ARTHUR H. COX & CO.,
Tasteless Pill Manufacturer,
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The attention of the Trade is invited to the following Specialties in elegant Pharmacy, which have received the highest encomiums and are being extensively prescribed by the Medical Profession.

QUINQUININE, MACKEYS' (Registered).—Contains the pure Alkaloids of the official Cinchona Barks, and has been largely used in Hospital and private practice with great success. Takes the place of Quinine at considerably less price. Every genuine bottle has the name Mackey, Mackey & Co. Price in 1 oz. vials, 5s. 6d.; also in 25 oz. and 50 oz. Tins.

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MACKEYS' MORRHUINE (Registered); or, Cod-Liver Oil Mixture.

—The most agreeable and efficacious mode of administering Cod-Liver Oil. This Mixture supplies a want that has long been felt, for a preparation of Cod-Liver Oil that is both pleasant to take and easy to digest.

By a process invented by Messrs. Mackey, Mackey & Co., the Cod-Liver Oil is converted into a perfect Emulsion, in which the particles of Oil are suspended in such a minute state of subdivision, that it is perfectly miscible with milk, water, etc.

Dr. M. BROWNE writes:—"Your MORRHUINE is so agreeable that it goes rapidly, and we must have some more."

STONEHOUSE, 30th October, 1881:—"Your MORRHUINE was kept down when all other preparations of Cod-Liver Oil were rejected."—H. B. SNELL.

MACKEY, MACKEY & Co. are sole manufacturers of the

NEW SOLUBLE TRANSPARENT GELATINE COATED PILLS. These Pills possess numerous advantages over the Pills of other makers, amongst which may be specified—They never crack or split. The coating does not peel off. They are moderate in price. The Ingredients are carefully selected, and of unimpeachable quality. The coating, which dissolves in about half a minute, is put on while the mass is soft, thus keeping the Pill in a perfectly soluble condition. The coating, which is unimpaired by age, is quite transparent, and the taste of the Pills is perfectly covered. The excipients chosen tend to preserve the soluble character of the Pill, and increase the medicinal effect of the drug.

Pills of the Pharmacopœias and private formulæ as required.

Samples and List forwarded on application.

SAXCERE HAMAMELIS; or, Ung. Hamamelis Album.—Prepared from Wych Hazel; a most serviceable remedy for the relief and cure of hæmorrhoids, valuable for sprains, wounds, and inflamed mucous surfaces. Price 4s. per lb.

MACKEYS' LIQUOR SANTAL CUM COPAIBA, CUBEBA, ET BUCHU.—When the disease is chronic, "the Liquor Santal acts like a charm." 8s. per lb. Dose, 1 to 2 drachms.

MACKEYS' CHLORODYNE.—Pink and Brown. Anodyne, astringent, antispasmodic, diaphoretic, sedative, in perfect combination, is miscible with water in all proportions, does not separate, and is most convenient for dispensing. 5s. per lb.

Dr. M. BROWNE writes:—"I and my people like your CHLORODYNE very much; it is far superior to any other maker's."

A liberal discount to the Trade on the above preparations.

CAUTION.—The large demand for our specialties has caused systematic imitations. The Trade is earnestly requested, if not ordering direct, to give special prominence to the word MACKEYS', e.g., Mackey's Quinquinine; Mackey's Mist Bismuthi Co.; Mackey's Chlorodyne, all soluble compounds of Cerium, and improved preparations of the Hypophosphites.

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HUBBUCK'S PURE OXIDE OF ZINC.

PHARMACEUTICAL CHEMISTS will use this in preference to the ZINCI OXIDUM of the Br. Ph. 1867, which is a return to the process of the Pharmacopœia of 1836, being a roasted carbonate as a substitute for the pure Oxide.

HUBBUCK'S PURE OXIDE is made by sublimation, and is warranted to contain upwards of 99 per cent. of Pure Oxide: in fact, the impurities are not traceable.

*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON.
Wednesday, April 2nd, 1856.

"On Pure Oxide of Zinc for Use in Medicine.

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide had been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

"The specimen of oxide of zinc on the table was not only free from all impurities, but it possessed the other qualities required. It was a perfectly white, light, and smooth powder.

"Mr. HUBBUCK stated that the oxide of zinc which his firm made for use in medicine was free from impurities commonly occurring in the oxide made by combustion. The zinc was first thoroughly refined, and all the lead, arsenic, cadmium, iron, and other impurities removed. The pure oxide was then produced by combustion, abstracting only the very finest part of the product for medicinal purposes. About one-tenth or one-twelfth of the whole was thus set apart in producing that from which the sample exhibited had been taken; and this could be done, since their usual operations requiring them to make several tons of oxide every day, they could separate as much as was required in a state of absolute purity, while the remainder would be equally valuable as a pigment.

"The CHAIRMAN thought the mechanical condition of substances used in medicine was often a matter of considerable importance, and ought to be considered as well as their chemical composition. He thought the specimen before the meeting was a very perfect one in every respect, and he had no doubt it was the sort of oxide of zinc best adapted for use in medicine."

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Harvey & Reynolds.
Hearon, Squire & Francis.
Herrings & Co.
Hodgkinson, Preston & King.
Hodgkinsons, Stead & Trencher.
Horner & Sons.

Huskisson, H. O. & Co.
Johnsons & Sons.
Langton, Harker & Staggs.
Lofthouse & Saltmer.
Mather, William.
Southall Brothers & Barclay.
Sumner, R. & Co.
Warren, A. & J.
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WHOLESALE AND EXPORT DRUGGISTS

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Manufacturing Pharmaceutical Chemists.

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*Laboratory and Drug
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The Active Principle of Willow Bark.

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Lancet.—"An excellent preparation; contains all the alkaloids of the Bark.
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At Medical International Congress, London, the Indian Bark was declared to be the Bark of the future.

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Made from Bark of *Cinchona Succinbra* as grown in Government Plantations of British India.

See opinions of Medical and Pharmaceutical Press, and testimony as to its superiority over all other Fluid Preparations of Cinchona.

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Price 10/6 per lb. OF

To be obtained of all Druggists (Wholesale and Retail) in the United Kingdom. In ordering, specify "UMNEY'S."

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Drugs, Chemicals, and Pharmaceutical Preparations.

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Wholesale and Export Druggists, and Operative Pharmacists,
101, HIGH HOLBORN, LONDON, W.C. Established 1751.

Prices Current on Application.

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In 2 oz. and 4 oz. Bottles, with Brush, 2s. 6d.
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Containing pure Vegetable Ivory Charcoal.
In boxes, 2s. 6d. each.

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To Wholesale Druggists, Chemists, Perfumers, &c.

We are now supplying *Sp. Vin. Rect.*, fine qualities, at a very low figure for cash; free from smell, and perfectly clean; for exportation likewise.

METHYLATED SPIRIT AND FINISH, 64 O. P.

E. BOWERBANK & SONS are selling the above at the lowest possible cash price of the day in quantities of Five Gallons and upwards. Quotations upon application.

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Guaranteed not to cause a deposit or become opaque by the addition of quinine. 5s. 9d. per gallon, net cash. Second Quality, 4s. 9d. net.

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Compound Syrup of Hypophosphite of Iron and Lime.

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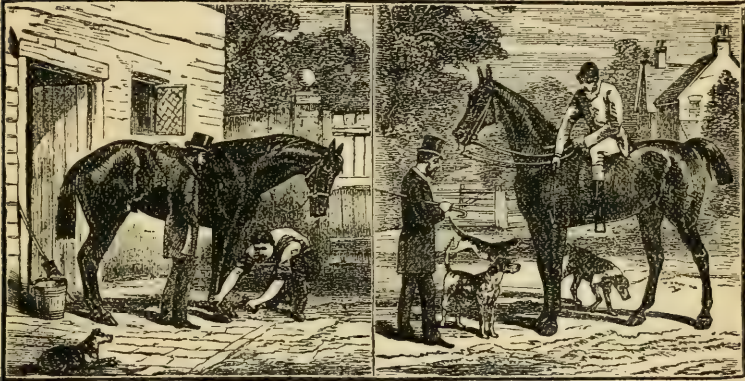
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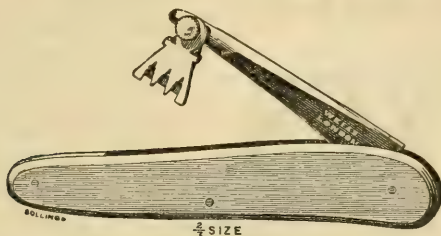
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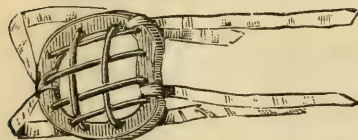
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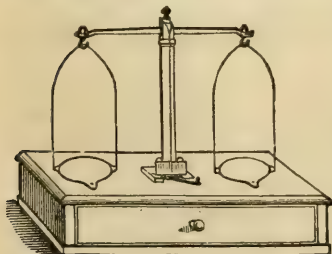


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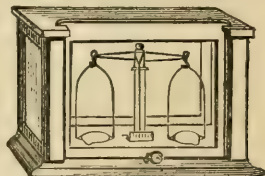
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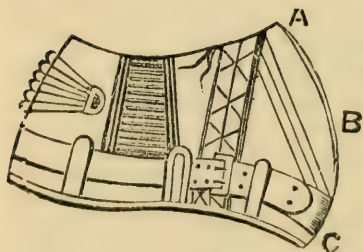
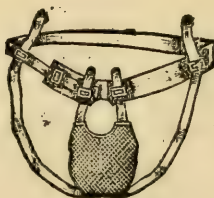
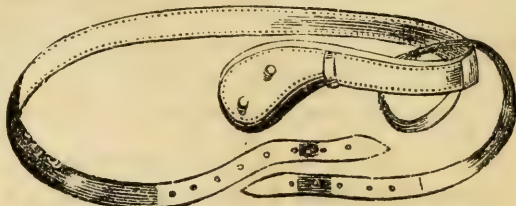
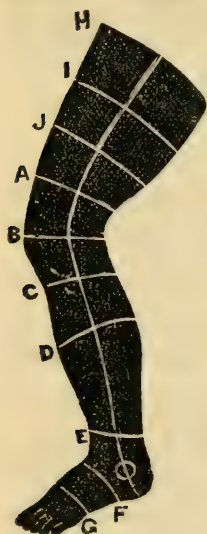
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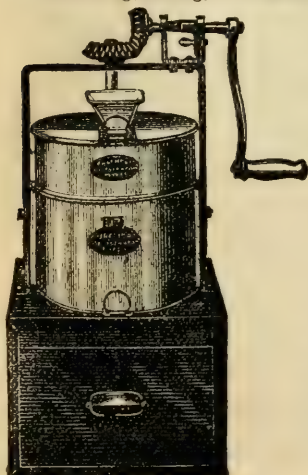
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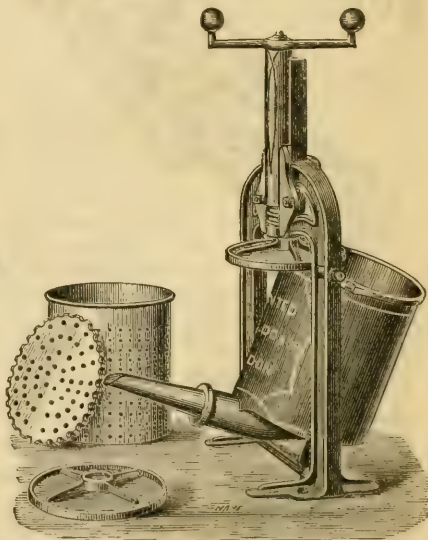
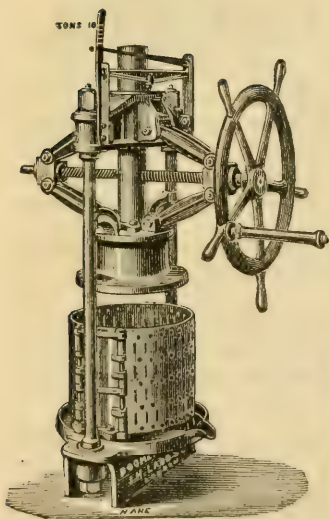
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Kinninmont, A., Glasgow.
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Mason, W. D., Grimsby.
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McCaull, J. & G., Londonderry.

McRae, Alexander, Edinburgh.
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Parsonson, T., Jersey.
Pattison, H., Coleham, Shrewsbury.
Pittuck, F. H., Hebburn-on-Tyne.
Quiray, W. D., Belfast.
Rand, E., Wagga-Wagga, New South Wales.
Senior, Harold, Norwood Lane, London.
Sibthorpe, S., Wolverhampton.
Smith, Albert, Ilfracombe.
Taylor, W. G., Hungerford.
Todd, Joe, Carlisle.
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Walton, M. F., Sowerby Bridge.
Waterhouse, A., Dewsbury.
Wills & Wootton, Westminster College.
Wing, Lewis, Chislehurst.

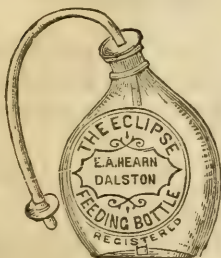
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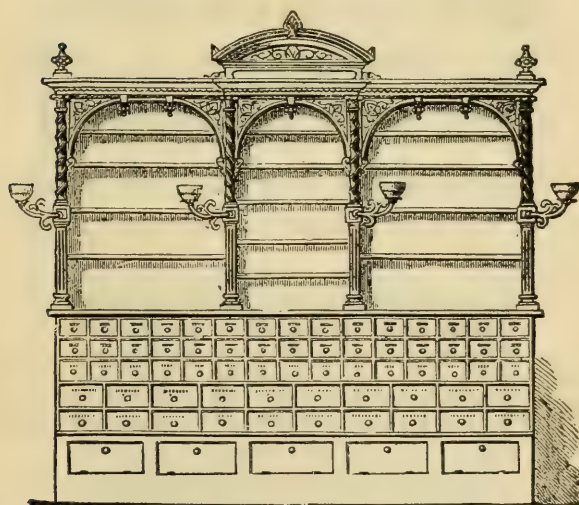
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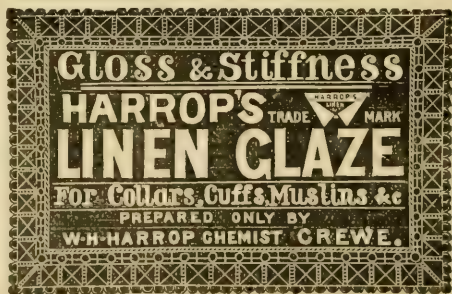
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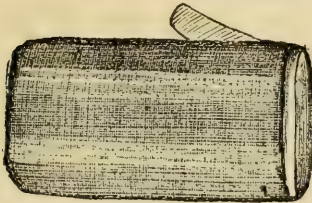
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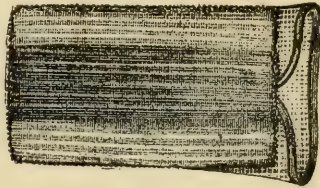
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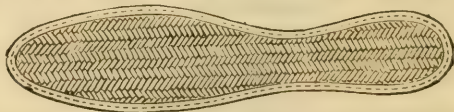
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Retail	1s. 6d.	Wholesale	12s. per doz.
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RIMMEL'S AROMATIC OZONIZER, a fragrant powder which, simply spread on a plate in apartments or places of public resort, evolves the refreshing and healthy emanations of the Pine and Eucalyptus, and produces a quantity of Ozone, the great air purifier. Its clean and portable nature renders it far preferable to liquid disinfectants. In 4-oz. Tins, 1s.; 1-lb. Tins, 3s. 6d.; Spreading Plate, 6d.

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ORIGINAL AND CELEBRATED
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Has been used in the highest circles half a century for cleansing, beautifying, and preserving the teeth and gums to old age.

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The **ORIENTAL TOOTH PASTE** is composed only of vegetable substances, blended with fragrant compounds. It is distinguished by its extraordinary efficacy in removing tartar, insuring to the teeth the most **BEAUTIFUL** and **PEARLY WHITENESS**, and inducing a healthy action of the gums. The **ORIENTAL TOOTH PASTE** gives **PECULIAR FRAGRANCE TO THE BREATH**, and will preserve the teeth and gums to **OLD AGE**. Pots, 1s. 6d., or *Double Size*, 2s. 6d. **KEEPS PERFECT IN ALL CLIMATES.**

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Cures Rheumatism, Neuralgia, Gout, Tic, Lumbago, Sciatica, Stiff Joints, Sprains, Bronchitis, Sore Throat, Stiff Neck, Mumps, Faceache, Cramp, Chilblains, etc.

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TERMS FOR ADVERTISEMENTS IN THE YEAR-BOOK OF PHARMACY
 Will be found on page 672.

BINGLEY'S SUPERIOR GINGER ALE.

In Aromatic and Non-Intoxicating Stimulant.

Manufactured by a Special Process worked out by the Proprietor, by means of which the true delicate flavour of Jamaica Ginger is fully retained.
It is confidently offered as a very superior article.

The following are a few of the opinions which have been expressed in reference to

BINGLEY'S GINGER ALE.

"The Chemist and Druggist"

Of January 15, 1883, in an article on "GINGER ALE," says:—"Last month we published a theoretical study of Ginger Beer; this month we have been called upon to make a practical study of the more fashionable heir of that old Beverage, GINGER ALE." In speaking of the GINGER ALE manufactured by Mr. BINGLEY, of Northampton, it states:—"We are bound to report most favourably. Very few Makers have succeeded in so perfectly presenting the odour and aroma of Jamaica Ginger in a clear, bright, sparkling beverage."

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Of August, 1883,—“We are particularly pleased with the Ginger Ale, which, as is not always the case, really presents the flavour of Ginger.”

The following are a few of the opinions expressed by Chemists and others:—

“Excellent in every way.”

“I like the Ginger Ale very much.”

“We have tasted the Ginger Ale and like it very much; indeed, it is the best thing of its kind we have met with.”

“We have received the case of Ginger Ale, and have tasted a bottle with one of . . . we think that your article has the advantage in point of delicacy of flavour.”

“Having carefully tasted the Ginger Ale you were good enough to send me, and also submitted it to the judgment of a friend in the trade, I can speak of it advisedly in terms of high commendation. The aroma is very fine, and the full, generous warmth in the mouth is as near perfection as possible.”

“I will write you about the Ginger Ale, it is first-rate.”

“The sample of Ginger Ale you were good enough to send me appears exceedingly good, and I shall be glad if you will send me one case at your convenience.”

“Capital stuff is this Ginger Ale.”

“Your Ginger Ale is excellent, and I shall be very glad if you will send me a case.”

“Your sample of Ginger Ale is everything that can be desired. The fine flavour of the Ginger alone shows the care with which the essence has been prepared, it will certainly command a line in my next order.”

“I have received the sample of Ginger Ale, and beg to state that it is the best I have ever tasted.”

“I am pleased to say that so far the customers we have supplied with your Ginger Ale have been very pleased with the same.”

“Your Ginger Ale is very delicious.”

“The Ginger Ale arrived a week ago; I think it is very nice indeed.”

“I certainly have not yet tasted anything to touch it.”

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20s. for a QUARTER-CASK, i.e., 12½ Gallons
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DO NOT THROW MONEY AWAY
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Tyrer's
"BOROUGH"
Ketchup

SILVER MEDAL
LONDON.

"MR. PETER TYRER,

School of Cookery, Crystal Palace, S.E. Jan., 1883.

"Sir,—I have been using the 'Borough' Ketchup, and am very pleased with it. Its flavour is excellent both for all kinds of Savoury Dishes and Soups; and I most certainly should advise every cook and housekeeper to use it, FOR I HAVE NEVER MET ITS EQUAL.—Yours truly, MARIAN SMITHARD, *Lectress on Cookery.*

CHAS. G. FOOT, Esq., M.D., of Tullow, Co. Waterford, in a letter says: "I shall recommend it to parties in this locality."

Copy of Analysis, June, 1882.

"The sample of Ketchup has been examined, and we are pleased to say that it contains nothing injurious or in any way objectionable to the constitution. Remark,—Very good."—*Anti-Adulteration Company.*

"Your very excellent 'Borough' Ketchup."—MADAM BARBARA W. GOTHARD, *Lecturer on Cooking at the Alexandra Palace, N.*

Proprietor of a large Restaurant in Glasgow, writing on August 18th, 1882, says: "It pleases very well."

A Customer at Woodbridge says: "I am glad to tell you the Ketchup gives great satisfaction."

A firm at Newcastle in August, 1882, wrote as follows: "We have the sample yet, and find it keeps well."

A Customer at Ramsgate on July 4th, 1882, in writing about the Ketchup used these words: "I must say it is excellent."

A Gentleman at Yalding, after receiving a cask, in September, 1882, writes: "I am very pleased with your 'Borough' Ketchup,—will answer every purpose I want it for."

A Chemist at Oxford, June 7th, 1882, writes: "I am very pleased with the Ketchup,—have just used it in making some Sauce. It is first rate."

A Chemist at Haslingden, August 2nd, 1882, writes: "The Ketchup has suited me well, and I shall certainly write for more when requiring it."

A Grocer at Yarmouth, November 11th, 1882, writes: "Your Ketchup gives general satisfaction."

A Chemist at Machynlleth, July 28th, 1882, writes: "The Ketchup I had from you last week is excellent, I am quite pleased with it."

"Will no doubt command the favourable attention of connoisseurs."—*The Medical Press.*

"It is the best I have ever tasted."—Dr. LOTHIAN, Glasgow.

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GUARANTEED PURE SOLUBLE COCOA of the Finest Quality,
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The FACULTY pronounce it "the most nutritious, perfectly digestible beverage" for BREAKFAST, LUNCHEON, or SUPPER, and invaluable for Invalids and Children.

Cocoatina is the highest class of Soluble Cocoa or Chocolate, with the excess of Fat extracted Mechanically.



Being all Cocoa it is four times the strength of preparations thickened yet weakened with arrowroot, starch, etc., and in reality cheaper than such mixtures.

Made instantaneously with boiling water, a teaspoonful to a breakfast cup, costing less than a halfpenny.

It keeps for years in all climates, and is palatable without milk.

In air-tight tin canisters at 1s. 6d., 3s., 5s. 6d., etc., by
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H. S. & Co.s GUARANTEED PURE FILTERED COCOA BUTTER is the best for all Medical purposes.

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AND ALL WHOLESALE HOUSES.

*DIPLOMA OF HONOUR, HIGHEST AWARD,
AMSTERDAM, 1883.*

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The object of the Planters who have formed this Association is to establish a business for the direct supply of Tea from the Plantations of the Kangra Valley to the public.

So great a success has attended the efforts of the promoters of the Association, that it has become necessary that one of the Planters should reside in England to manage its affairs.

The distinctive feature of the business of this Association is that the Tea is delivered to consumers in the original one pound tinfoil-lined parcels in which it is packed in the Valley, and it is guaranteed to be absolutely pure.

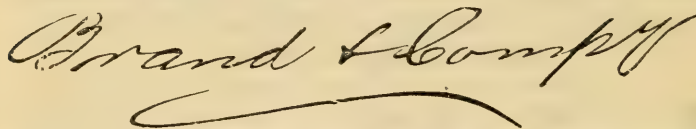
Vide Allen's Indian Mail, Feb. 28, 1883:—" . . . We can speak from actual knowledge of the excellence of the Teas of the 'Kangra Valley Indian Tea Growers' Association,' and as in advertising them we are also benefiting those who take advantage of their enterprise, we append their modest prospectus, which promises no more than they are well able to perform."

These Teas, retailing respectively at 4/-, 3/, and 2/6, can be purchased in any quantity, either direct from the Store, 7, New Coventry Street, or from

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Agents to the Association, from whom Show Cards can be had on application.

Special terms granted to all Chemists and Druggists, to whom the Teas, on account of their absolute purity, are particularly recommended.



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No. 11, Little Stanhope Street, Mayfair, London, W. (top of Down Street, Piccadilly),

Beg respectfully to call the attention of the Trade to their

SPECIALTIES FOR INVALIDS.

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ESSENCE OF BEEF, MUTTON, VEAL, AND CHICKEN.

BEEF-TEA JELLY AND FIBROUS EXTRACT OF BEEF.

TURTLE SOUP AND JELLY, AND CALF'S FOOT JELLY (prepared expressly for invalids).

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Extract from the British Medical Journal, 21st and 28th November, 1874.—The preparations manufactured by Messrs. Brand & Co., of No. 11, Little Stanhope Street, Mayfair, London, and known as "CONCENTRATED BEEF TEA" and "ESSENCE OF BEEF" respectively, are already largely used by leading medical practitioners in the metropolis. The first is for ordinary use, the second is more especially suited for very delicate stomachs and for invalids. They are prepared with great care from English meat of good quality, and in delicacy of flavour, the fluid extract (Essence of Beef) is well known by London Physicians to be a preparation on which they can entirely rely. Hence the favour which it has met, and our reason for mentioning now with approval the samples submitted to us.

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No. 1 Oriental Blend,	1/8 per lb.,	for retail at	2/- per lb.
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These Teas show a good profit to the retailer, and are supplied neatly wrapped in $\frac{1}{4}$ -lb., $\frac{1}{2}$ -lb., and 1-lb. packets, lined with tinfoil; also in 5-lb., 10-lb., and 20-lb. tins, or half chests of 50 lbs.

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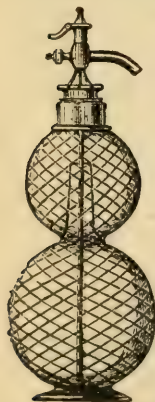
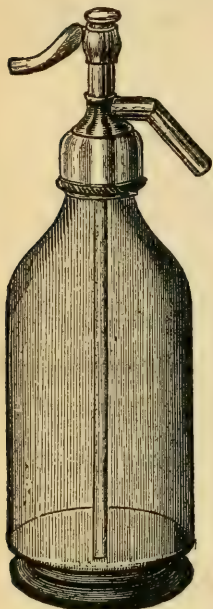
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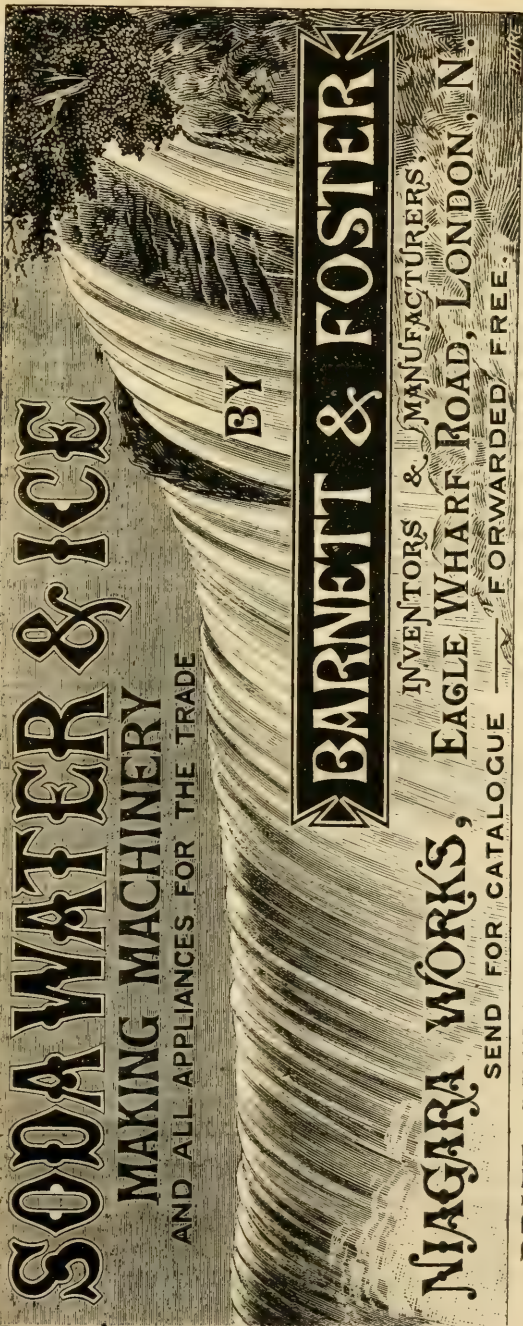
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